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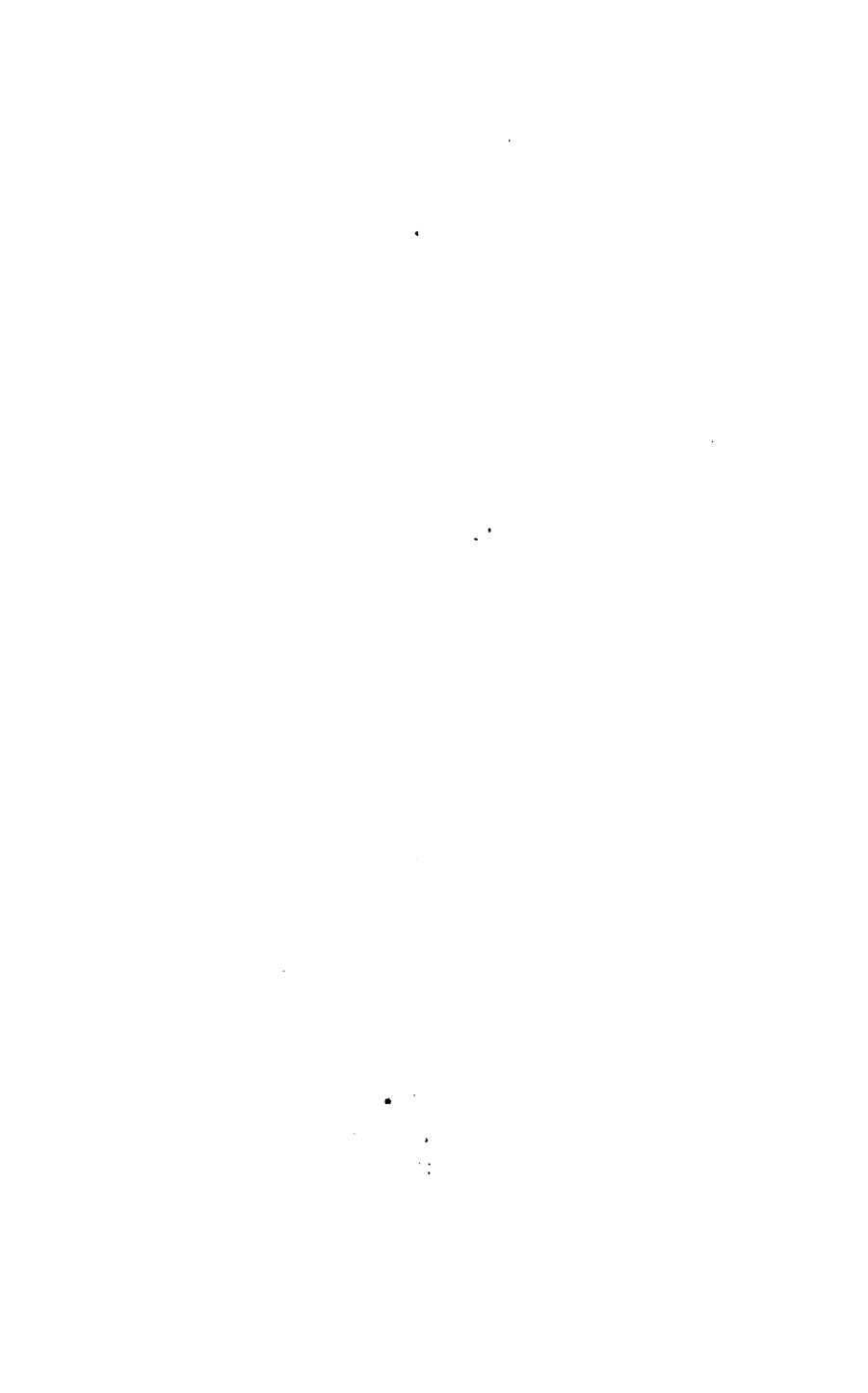




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HOW TO BECOME
QUICK
AT
FIGURES.

—COMPRISING—

THE SHORTEST, QUICKEST, AND BEST METHOD OF BUSINESS CALCULATIONS.

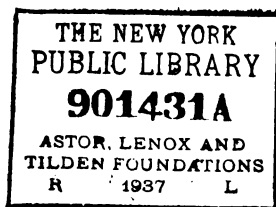
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MEN WANTED.

“ It has been truly said that the great want of the age is men. Men of thought ; men of action. Men who are not for sale. Men who are honest to the heart's core. Men who will condemn wrong in friend or foe—in themselves as well as others. Men whose consciences are as steady as the needle to the pole. Men who will stand for right if the heavens totter and the earth reels. Men who can tell the truth and look the world and the devil right in the eye. Men who neither swagger nor flinch. *Men who are Quick at Figures.* Men who can have courage without whistling for it, and joy without shouting to bring it. Men through whom the current of everlasting life runs still, and deep and strong. Men too large for certain limits, and too strong for sectarian bands. Men who know their message and tell it. Men who know their duty and do it. Men who know their place and fill it. Men who mind their own business. Men who will not lie. Men who are not too lazy to work, nor too proud to be poor. When in office, the workshop, in the counting-room, in the bank, in every place of trust and responsibility, we can have such men as these, we shall have a christian civilization—the highest and best the world ever saw.”

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DO SOMETHING.

Do not spend your precious time in wishing, and watching, and waiting for something to turn up. If you do, you may wish and watch and wait forever. You can do it if you wish, but you must put forth the effort. Idleness and indifference never accomplished anything. It takes energy and push to make headway in the world, and an active, energetic, persevering man is sure to succeed. If he can not do one thing he will do something else. If he can not succeed in one direction he will in some other. He will do something. He will not waste his time in idleness. There is no lack of work, no lack of opportunities. Do what comes to your hand, and do it well. True progress is from the less to the greater. You must begin low if you would build high. Work is ordinarily the measure of success. Quit resolving and re-resolving and go and do something.— *School Supplement.*

ADDITION.

The adding of one or more columns of figures should be done without mental labor, and may be acquired by anyone with a good deal of practice.

The art of adding quickly is acquired by learning to *read* a column of figures as you would a sentence composed of words, and those words composed of letters. By *Practice* we have become so familiar with letters that when we see them grouped together, it is unnecessary to separate them, or spell out the words, but we can tell at a glance what the word is.

By *Practice* we may become so familiar with figures that when we see a group of them, we can tell at a glance what the sum of them reads, without spelling the figures at all.

In practicing the reading of a column of figures in this way, we do not let the brain work at all, but simply pass the eye over the figures (see drill tables) as if you were reading a sentence, slowly at first, but increase the speed as proficiency is acquired.

A few minutes daily practice will produce astonishing results in a very short time ; beginning with two figures, then three, four, and so on until finally we become able to write the *Sum* total of long columns. For example, when we see the figures 9, 8, 6, 4, we know at a glance that the sum is 27 without reading the figures themselves or spelling them out.

Reading a column of figures as the reading of a sentence, is done by dividing a large group of figures

into smaller ones and from group to group through the column, just as from word to word we read through a sentence.

We give various methods, but commend the *grouping* method as the best and most practiced.

Addition is more frequently used than all other operations combined.

The most important qualities of an accountant are accuracy and speed. The most speedy calculators are usually the most correct.

It is a deplorable fact that not one in one hundred of our graduates fresh from the High School can add a column of figures correctly without many trials.

No labor should be regarded too great to master this, the key to all numerical as well as business transactions.

RESULTS ONLY.

Never spell your way through a column, thus: 6 and 8 are 14, and 9 are 23, etc. It is just as easy to name results only, and much more rapid.

For the purpose of explaining a method, examples will be sometimes spelled out, but it is never recommended as a method to be adopted.

3 6 7	Begin at the bottom of the right hand
8 5 4	column, and name results only:
9 7 6	14, 23, 31, 37, 46, 52, 56, 63.
3 8 9	Then adding 6, the carrying figure, to the
7 3 6	second column, we have:
5 4 8	15, 17, 24, 28, 31, 39, 46, 51, 57.
4 7 9	Again carrying 5 to the next column, we
7 2 6	say:
6 9 8	11, 18, 22, 27, 34, 37, 46, 54, 57,
<hr/> 5 7 7 3	which completes the operation.

NOTE.—When 9 occurs in addition it is easier to add ten and subtract one mentally. thus: instead of $9 + 8 = 17$, say, $10 + 8 = 18 - 1 = 17$.



ADDITION.

GROUPING.

By this method we mentally group the figures above 10 and under 20.

To the first group add the tens of the next group, and to this sum add the units of the second group.

In order to become proficient in grouping, familiarity of totals will be absolutely necessary. The *sum* of the figures must be read instead of the figures themselves. By a proper understanding of this method, the mental labor is much less than by the old ones; half the labor is simply counting by regular notation, because the left hand or tens figure to be added is always the same, and the right hand or units figure usually of a small denomination. By an analysis of the example under this head, we find the first column in group to read:—

7	}	10	To 11, the first group, add the tens of the second group, we have 21, adding the unit 4 of this group we have 25, adding the tens of the third group we have 35, and adding 3, the units figure of the group we have 38, adding the tens of the fourth group we have 48 which completes the operation.
3			
5			
8			
5			
9			
8			
8			
3			
3			

SECOND COLUMN.

8	}	12	4 the carrying figure of the previous column, added to the first group we have:— $4+10+3+10+2+10+10+2=51$ By naming result only, we have:— 4, 14, 17, 27, 29, 39, 49, 51
4			
4			
6			
4			
8			
6			
7			
7			
7			

We recommend to name the carrying figure the first, and when a nine occurs call it 10, and subtract 1 in the operation.

ADDITION.

GROUPING.

487	
943	
345	
868	
	SPELLING PROCESS.
145	$11 + 10 + 4 + 10 + 3 + 10 = 48$
989	$4 + 10 + 3 + 10 + 2 + 10 + 10 + 2 = 51$
568	
673	$5 + 10 + 1 + 10 + 10 + 1 + 10 + 3 = 50$
<hr/>	
5018	

The sum of any two figures can never exceed a *ten*; therefore, the left hand figure of the sum of any two figures must always be *one*.

It is, by this method, no more difficult to read the sum of two figures, than to read a single figure.

In the process we pay no attention to the figures as they stand written, but only the sum of two of them.

In the above example, instead of reading 11, 20, 25, 33, etc., we say:

11, 21, 25, 35, 38, 48.

4, 14, 17, 27, 29, 39, 49, 51.

5, 15, 16, 26, 36, 37, 47, 50.

It will be noticed that the left hand figure increases by regular notation, 1, 2, 3, 4, 5, 6, etc.

Practice will enable one to add much more rapidly than by the old method, with less liability to error, because it is systematic and simple, and requires less mental labor.

ADDITION.

DRILL TABLES.

These Drill Tables must be thoroughly mastered. Read from left to right and right to left, the sum *only*, as rapidly as possible ; when you falter or make an error, go back and start again.

We would advise teachers to have a daily black-board exercise of these drill tables for addition.

Divide the exercises. Write series that are simple and easily comprehended.

1st. Read the sum of two figures only, in every possible combination.

2d. Read the sum of three figures only.

3d. Read in two columns of two figures, then three, and also mixed numbers.

It will make a pleasant, entertaining, as well as useful change from the regular routine. One month's daily exercise will result in surprising proficiency.

The whole school should be engaged in these exercises, and combinations varied and made more difficult, slowly.

Hint. One of the most accomplished accountants in the city of Boston, informed the writer that he owed his success as an accountant entirely to his being a *confident* adder, which he acquired largely by appropriating all figures in sight, and reading their sum only. Numbers on the streets, numbers of railroad cars, etc., etc., served as drill masters to him on many occasions.

ADDITION.

DRILL TABLE No. 1.

[illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible]

ADDITION.

DRILL TABLE No. 3.

[illegible][illegible][illegible][illegible][illegible][illegible]

TWO COLUMNS AT ONE OPERATION,

FROM LEFT TO RIGHT

If two or more columns can be added at one operation, there must be some rule or method by which it is done. The following illustrates one of the most practical methods :—

25	SPELLING PROCESS.
63	$27 + 50 = 77 + 4 = 81$
78	$81 + 30 = 111 + 4 = 115$
34	$115 + 70 = 185 + 8 = 193$
54	$193 + 60 = 253 + 3 = 256$
27	$256 + 20 = 276 + 5 = 281$
<hr style="width: 10%; margin-left: 0;"/>	
281	

This process consists simply in adding the tens first and then the units.

READING PROCESS.

27, 77, 81, 115, 185, 193, 253, 256, 276, 281.

Practice will enable one to add two or more columns without much mental effort, because it is just as easy to say, $27 + 50 = 77 + 4 = 81$, as it is to say, $5 + 2 = 7$, or $7 + 4 = 11$.

Proficiency in the above method will soon enable one to add without separating each number into tens and units, thus :—

27, 81, 115, 193, 256, 281.

The all important thing is familiarity of totals, and we herewith append drill tables, applicable to this kind of addition, which must be read from each direction as advised before.

ADDITION.

DRILL TABLE No. 4.

24	43	52	84	12
32	25	34	21	82
—	—	—	—	—
25	64	25	72	84
47	52	38	29	63
—	—	—	—	—
23	63	89	38	85
38	94	98	93	04
—	—	—	—	—
95	38	68	94	39
64	46	89	38	85
—	—	—	—	—
25	93	38	97	39
78	36	48	68	95
—	—	—	—	—
98	97	39	76	84
38	84	98	34	88
—	—	—	—	—
89	78	63	82	21
99	87	36	67	79
—	—	—	—	—
75	85	95	65	55
81	98	79	56	29
—	—	—	—	—
76	63	55	78	89
86	81	75	84	92
—	—	—	—	—

ADDITION.

DRILL TABLES.

Read rapidly from left to right and right to left
the sum only in the following combinations : —

9	8	7	8	9	6	7	8	9	8	9	7	9	8	9
8	7	9	4	6	8	3	4	3	6	5	8	5	4	3
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

24	35	72	94	39	36	28
32	46	82	38	48	59	39
—	—	—	—	—	—	—

9	1	9	9	6	2	8	6	7	8	5	8	9
5	2	8	6	5	3	4	7	6	3	6	5	8
4	6	3	3	9	8	3	8	5	2	9	6	7
—	—	—	—	—	—	—	—	—	—	—	—	—

24	26	35	53	63	36	37	73	83
12	36	45	54	64	46	47	74	84
32	46	55	55	65	56	57	75	85
—	—	—	—	—	—	—	—	—

1.25	12.50	9.50	29.40	45.90
.84	3.42	.21	3.50	1.50
5.62	.40	4.21	6.30	56.89
—	—	—	—	—

Combinations should be varied and made more difficult as proficiency is acquired. The secret in adding rapidly consists in familiarity with totals of combinations. Counting is not adding, and spelling is not reading.

ADDITION.

THREE COLUMNS AT ONE OPERATION,

FROM RIGHT TO LEFT.

Three or more columns may be added at one operation thus:—

$$\begin{array}{r}
 223 \\
 425 \\
 384 \\
 256 \\
 \hline
 1288
 \end{array}$$

OPERATION.— $256+4=260$, $260+80=340$, $340+300=640$, $640+5=645$, $645+20=665$, $665+400=1065$, $1065+3=1068$, $1068+20=1088$, $1088+200=1288$.

By naming results only, we have:—

260, 340, 640,
645, 665, 1065,
1068, 1088, 1288.

It will be noticed that beyond two, or at most three, columns wide and a few columns deep, this method requires more mental labor than the previous ones, and is not considered very practical except for development of the mental faculties.

EXAMPLE 2.

$$\begin{array}{r}
 2.25 \\
 .35 \\
 8.46 \\
 .08 \\
 15.60 \\
 2.13 \\
 1.40 \\
 \hline
 30.27
 \end{array}$$

PROCESS.

340, 350, 353, 1353, 1853, 1913, 1921,
2721, 2761, 2767, 2797, 2802,
3002, 3022, 3027.

ADDITION.

THE LIGHTNING METHOD.

AN OLD TRICK EXPOSED.

This simple and wonderful combination of figures has deluded many into believing that adding from left to right such a large body of figures, instantaneously and correctly, to be a Herculean task.

Large sums have been paid by the unsuspecting and credulous for the possession of the wonderful secret.

It is probably the simplest, as well as the most delusive combination of numbers, because if operated in the hands of an expert it is almost impossible to be detected, unless by those who know the secret.

EXAMPLE :

3	4	5	6	8	8	9	3	4	2
6	5	4	3	1	1	0	6	5	7
3	5	8	4	3	8	4	3	8	9
6	4	1	5	6	1	5	6	1	0
7	8	6	8	9	8	4	5	6	8
<hr/>									
2	7	8	6	8	9	8	4	5	6

The operation is as follows: A line of figures is given you, to the length of which you are wholly indifferent, as in above example.

3 4 5 6 8 8 9 3 4 2 (First line.)

Now you claim the privilege of writing a line immediately underneath it. Your line will be in pairs of 9's, and will read :

6 5 4 3 1 1 0 6 5 7 (Second line.)

Now ask another line immediately under these ; any figures whatever, for example :

3 5 8 4 3 8 4 3 8 9 (Third line.)

ADDITION.

You write another to pair it into 9's:

6 4 1 5 6 1 5 6 1 0 (Fourth Line.)

Another line of figures is given you:

7 8 6 8 9 8 4 5 6 8 Fifth or Key Line.

This is called the key line, because the sum of the entire column is simply this line repeated, with 2 subtracted from the right, and 2 annexed to the left. In other words, the result being just like it, except the units' place, which is as many less than the units in the key line as there are pairs of lines, and annex a similar number to the extreme left of the sum. The number of lines is necessarily odd.

For the purpose of explanation we will add the column without the key line.

	3	4	5	6	8	8	9	3	4	2
	6	5	4	3	1	1	0	6	5	7
	3	5	8	4	3	8	4	3	8	9
	6	4	1	5	6	1	5	6	1	0
	<hr/>									
1	9	9	9	9	9	9	9	9	9	8
										2
	<hr/>									
2	0	0	0	0	0	0	0	0	0	0

Subtracting two from the right hand figure of the key line is equivalent to adding two to the other columns, which would bring all the other figures ciphers as above.

It matters not, therefore, what the key line is, so long as we call the right hand figure two less, and annex two to the left.

A little practice will make this a very interesting trick.

ADDITION.

SECOND APPLICATION OF THE "LIGHTNING" METHOD.

Take any three columns of figures as follows :—

6 3 4 5 6
 3 8 4 2 9
 2 5 6 3 6
 1 7 2 1

Pair the last two with 9's and all the columns will stand thus :—

6 3 4 5 6
 3 8 4 2 9
 6 1 5 7 0
 2 5 6 3 6
 7 4 3 6 3
 —————
 2 6 3 4 5 4

The top line repeated with 2 subtracted from the right hand figure and 2 annexed on the left, completes the operation.

THIRD APPLICATION OF THE LIGHTNING METHOD:

5 6 7 8 } 9's
 4 3 2 1 }
 6 3 9 4 } 9's
 3 6 0 5 }
 7 8 6 3 } 9's
 2 1 3 6 }
 4 3 8 4 } 9's
 5 6 1 5 }
 8 9 8 7 Key Line.
 —————
 4 8 9 8 3

In this example we have four pairs of nines; therefore, subtract 4 from the right hand figure in the key line, and annex 4 on the left.

ADDITION.

LEDGER COLUMNS.

A great part of the work of an accountant consists in adding long ledger columns, like the following. Let the pupil find the sum of the numbers in each, being as careful to obtain a correct result as he would be if he were to receive or pay the several amounts.

Combinations should be varied and made more difficult as proficiency is acquired. The secret in adding rapidly consists in familiarity with totals of combinations. Counting is not adding, and spelling is not reading.

8.37	.78	673.28
4.33	.47	597.84
7.62	.53	3426.87
.48	2.75	219.48
.97	1.20	8.37
2.50	4.37	167.84
6.19	8.29	5986.32
10.00	13.85	6749.31
4.28	2.00	4863.27
8.07	.62	7542.35
4.37	.25	2986.28
9.48	1.37	379.87
4.21	9.83	2.59
13.26	6.75	69.80
1.20	8.43	4060.75
.57	10.48	309.71
3.08	6.00	124.87
4.96	1.00	8520.06
.85	1.50	2493.28
4.00	7.69	48.75

THE EASY WAY TO ADD.

This method of adding numbers is especially designed for those whose minds are constantly employed with business affairs, the mind being relieved at intervals, and the mental labor of carrying over the sum of an entire column is obviated by the use of *Integers* or "catch figures."

EXAMPLE.

$\begin{array}{r} 47 \\ 7 \\ 6 \\ 36 \\ 4 \\ 9 \\ 47 \\ 7 \\ 6 \\ 48 \\ 8 \\ 6 \\ 38 \\ 4 \\ 2 \\ 9 \\ \hline 86 \end{array}$
Process.—Begin at 9 to add as near 20 as you can, thus: $9 + 2 + 4 + 3 = 18$, reject the tens and place the 8 to the right of the 3, as in example; begin at 6 and add $6 + 8 + 4 = 18$, reject the tens, as before, and place 8 to the right of 4, as in example; begin at $6 + 7 + 4 = 17$, reject tens, place 7 to the right of 4, as in example; then $9 + 4 + 3 = 16$. reject tens, place 6 to the right of 3; then $6 + 7 + 4 = 17$, reject tens and place 7 to the right, as before; having arrived at the top of the column, add the figures in the new column, thus: $8 + 8 + 7 + 6 + 7 = 36$, or 3 tens and 6 units; place the 6 units as the unit's figure of the sum, having 3 tens to carry to 5 tens, the number of integers or catch figures already rejected. $3 + 5 = 8$ tens, which prefixed with the 6 makes 86 the sum.

ADDITION.

N. B.—The small figures we set to the right are called *Integers*, “*tally*,” or *catch figures*.

If upon arriving at the top of the column there should be one or more figures whose sum will not equal 10, add them to the sum of the figures in the new column; never place an extra figure in the new column unless it is an excess over 10.

3 EXAMPLE.—Proceed as before; begin at the
 2 bottom, $2 + 7 + 6 = 15$, reject the tens, place
 4 5 to the right of 6; $6 + 4 + 5 = 15$, reject as
 3^a before, place 5 to the right of 5; say $8 + 7 +$
 7 $3 = 18$, reject as before, etc. Now we have
 8 three figures which do not add 10; add them
 5^b to the new column and say $5 + 5 + 8 + 4 +$
 4 $2 + 3 = 27$; place the 7 under the original
 6 column, add 2 to the number of tally figures,
 6^b which is 3, thus: $3 + 2 = 5$, the tens figure in
 7 the sum, and makes 57, the answer.
 2
 57

Two or more columns can be added in the same manner.

593⁹ EXAMPLE.—Proceed as in adding a single
 65 column. The sum of the first column being
 648 49, we write the 9 and carry the 4 to the next
 33 column, thus: $4 + 2 + 8 + 3 = 17$, reject
 42^a the tens as before, write the 7 to the left of the
 53 3; then proceed as with a single column.
 765

78 REMARK.—To add very long columns, it is
 43² better to add as near 30 as possible, instead of
 734 20 as in above examples. The reason for sug-
 82 gesting this method is to decrease the number
 23 of “tally” figures. It must be remembered,
 659 however, by adopting 30 as a standard, that two tens
 will be rejected instead of one, as in the former ex-
 amples, which will be observed in the following:

ADDITION.

EXAMPLE.

3²

2

4

8

5

3⁸

1

6

7

4

2

5

3⁷

7

8

4

5

1⁹

2

9

3

4

2

3

5

6⁸

4

4

5

4

3

2

2⁸

4

3

6

4

5

4

162

is

the

mind

and

adopt

the

preceding

rules.

Process.—Here we begin at the bottom as before, adding over 20 and under 80, placing the excess or tally figure wherever it occurs in the line, thus: $4 + 5 + 4 + 6 + 3 + 4 + 2 = 28$, reject the 2 tens, place the 8 to the right of 2, etc.

By an inspection of the example it will be seen that $8 + 8 + 9 + 7 + 8 + 2 = 42$, the sum of the tally figures; place 2 as the unit's figure of the sum; carry 4 to twice the number of tally figures, since the twenties, not the tens, were rejected as tallies, so we say twice 6 are 12 and 4 to carry are 16; prefix this with the 2 units, and we have 162, the sum of the whole column.

NOTE.—The reason for adding numbers by tally figures must be clear, since it is nothing more than a condensing process, which can be briefly explained thus: take for instance the tally figures in the preceding example which are 8, 8, 9, 7, 8, 2, which when fully written out, would make the column read, 28 But since the tens' figures are all alike, it is necessary to write the units only, and simply bear in mind that for every unit's figure written out we have two tens, and thus abbreviate.

REMARK.—This mode of adding is especially designed for those whose minds are constantly employed on business affairs, and who are apt to be interrupted. A little practice will enable anyone to add rapidly and *always* correctly without any mental labor or fatigue.

But the young accountant, whose *business* it is to add, and *nothing else*, should rely entirely upon the mind and adopt the preceding rules.

ADDITION.

Adding with Periods.

Another condensed method of Addition is by periods, which is illustrated in the following example:

Commence thus: 3 4 4 2 3 2
 $= 18$, reject ten, place a period to the right of
 2, carry 8 to the next figure, thus: 8 3 4
 $2 = 17$, place the period to the right of 2,
 reject ten, carry 7 to next figure, 7 4 3
 $4 = 18$; place period to the right of 4, reject
 ten, carry 8 to next figure, 8 5 4 2 =
 19; reject ten, place 9 as the unit's figure in
 the sum; the number of periods, which are 4 in
 this case, will be the tens' figure in the sum of
 the column and completes the addition.

49

General Rules for Addition.

1. Write numbers plainly and distinctly, so that 9's may not be mistaken for 7's, or 5's for 8's.

2 Write the numbers in vertical lines. Irregularity in placing of figures is the cause of many errors.

3. Think of results, and not of the numbers themselves. Thus do not say 4 and 5 are 9, and 6 are 15, and 7 are 22, etc.; but 9, 15, 22, etc.

4. Make combinations of 10 or other numbers as often as possible, and add them as single numbers. Thus: in adding 9 34 73 214 9 54 82 123, say 9 16 26 33 42 51 61 67, taking each group at a glance as a single number. When a figure is repeated several times, multiply instead of adding.

5. In adding horizontally begin at the left, since the eye is more accustomed to moving from left to right than from right to left.

6. In adding long columns, prove the work by adding each column separately in the opposite direction before adding the next column.

We believe that addition should be *drilled into* every boy, every day, from the beginning to the end of his school life. It is ten times more important than measures, multiples, interest, percentages, stocks, etc., all put together, and the sooner teachers thoroughly understand this fact the more practical and beneficial will be the result of our school system.

Pupils should be trained to add figures when placed in a horizontal position as well as when placed in a vertical position. In the following exercises add both ways, and then prove the results by adding them.

Ex. 1.	4621	3946	4256	8432	1562	=	22817
	421	5000	7060	85	984	=	****
	2012	1213	214	143	275	=	****
	1604	2103	1524	2138	4215	=	****
	2385	6214	3121	1562	1428	=	****
	11043	****	****	****	****	=	

Ex. 2.	\$42 50	\$13 40	\$243 10	\$3 04	\$136 15	
	3 80	214 20	14 20	14 27	2 17	
	25	2 60	181 10	1 00	13 84	
	175 16	1 25	19 40	125 10	184 15	
	10 80	13 75	161 15	2 00	6 17	

MULTIPLICATION.

In the ordinary process of multiplication we obtain partial products and then add these together for the entire product. With a little wholesome practice, however, we multiply by a number consisting of several figures, without writing out the partial products. There are those who can multiply by a number consisting of 10 to 12 or even more digits, writing the result under the given number with great readiness. This is a very unusual degree of proficiency; but almost anyone can learn to do the same with a multiplier consisting of from 2 to 6 places. We indicate the method by the following problems and solutions. To make the operations easily understood, we have selected small numbers at first, and advance into higher and more difficult ones, step by step, and whoever studies the method thoroughly, and practices perseveringly, will be amply rewarded for the time devoted to the task.

EXAMPLES. — PROCESS.

$\begin{array}{r} 23 \\ 32 \\ \hline \end{array}$
 1st. $2 \times 3 = 6$, we write down the 6 for the units figure in the product.

736 2d. $(2 \times 2) + (3 \times 3) = 13$, we write down the 3 for the ten's figure in the product, and reserve 1 to carry.

3d. $3 \times 2 = 6 + 1$ (we carried) $= 7$, which completes the product.

MULTIPLICATION.

EXAMPLE 2.

78
27
— 1st. $7 \times 8 = 56$, we write down 6 as the unit's figure in the product, reserving 5 to carry.

2106 2d. $(7 \times 7) + (2 \times 8) + 5$ (to carry) $= 70$; We write down the 0 for the ten's figure in the product, reserving 7 to carry.

3d. $2 \times 7 + 7 = 21$, which completes the product.

EXAMPLE 3.

126
35
— 1st. $5 \times 6 = 30$, write down 0 as the unit's figure in the product, reserving 3 to carry.

4410 2d. $(5 \times 2) + (3 \times 6) + 3 = 31$, write 1 for the ten's figure in the product, reserving 3 to carry.

3d. $(5 \times 1) + (3 \times 2) + 3 = 14$, write 4 for the hundred's place in the product, reserving 1 to carry.

4th. $3 \times 1 + 1 = 4$, which completes the product.

EXAMPLE 4.

324
436
— 1st. $6 \times 4 = 24$, write 4 as the unit's figure in the product, reserve 2 to carry.

141264 2d. $(3 \times 4) + (2 \times 6) + 2 = 26$, write 6 as the ten's figure in the product, reserving 2 to carry.

3d. $(6 \times 3) + (4 \times 4) + (3 \times 2) + 2 = 42$, write 2 as the hundred's figure in the product, reserving 4 to carry.

4th. $(3 \times 3) + (4 \times 2) + 4 = 21$, write 1 as the thousand's figure in the product, reserving 2 to carry.

5th. $4 \times 3 + 2 = 14$, which completes the product.

THE SLIDING METHOD

—OF—

MULTIPLICATION.

Probably the easiest method to learn to multiply large numbers in a single line is the sliding method as used by Peter M. Deshong, which is in reality nothing more than cross multiplication, as illustrated ; but for the beginner it is the best that can be adopted. When familiar with the slide the student can proceed without it, and perform operations astonishing to himself and those who witness the operation, the largest numbers being readily multiplied in a single line.

This method can easily be understood by following the examples and solutions here given with paper and pencil.

MULTIPLICATION.

EXAMPLE. — PROCESS.

$$\begin{array}{r} 324 \\ 436 \\ \hline \end{array}$$
 Write the multiplier on a slip of paper separate from that on which the multiplicand is written, in an inverted order, thus: 634; place this slip directly over the multiplicand, so that the 4 will be directly over the 6, thus:

$$\begin{array}{r} 634 \\ 324 \end{array}$$

then say $6 \times 4 = 24$, write 4 as your unit's figure in the product, reserving 2 to carry; now slide the paper to the left so that 2 will come under 6, and 4 under 3, thus:

$$\begin{array}{r} 634 \\ 324 \end{array}$$

now $(6 \times 2) + (4 \times 3) + 2 = 26$, write 6 as the ten's figure, reserving 2 to carry; again slide the paper to the left so that 3 falls under 6, 2 under 3, and 4 under 4, thus:

$$\begin{array}{r} 634 \\ 324 \end{array} +$$

and you have $(6 \times 3) + (3 \times 2) + 2 = 42$, write 2 as hundred's figure in product, reserve 4 to carry; slide the paper again and the 3 will be under 3, and 2 under 4, thus:

$$\begin{array}{r} 634 \\ 324 \end{array}$$

and you have $(3 \times 3) + (4 \times 2) + 4 = 21$, write 1 as the thousand's figure in the product, reserving 2 to carry; now slide again, that 3 will be under 4, thus:

$$\begin{array}{r} 634 \\ 324 \end{array}$$

and you have $3 \times 4 + 2 = 14$, which completes the product, 141264.

We have used the same figures in this, as in the preceeding example, and by close observation it can readily be seen that the work is all the same. The sliding method, however, saves the mental labor of

MULTIPLICATION.

carrying over, in the mind, so many figures, which is quite wearisome to the unpractised mind. These additions will soon be performed at a glance, as the products are obvious without the formality of naming factors, which the student should never allow himself to do in any operation; it is just as easy to name products only. To understand these directions thoroughly, factors must be placed upon slips of paper, and the directions strictly complied with, which will give an insight into the mode of operation, and the reason will be better understood in ten minutes, than in three hours without them. When once familiar with the slide, the student may proceed without it. We will solve another example upon the same principle, naming products only, as it should be operated.

EXAMPLE. — PROCESS.

5768

324

On a separate slip of paper, as before, invert the multiplier, thus: 423; place the multiplier so that 8 will be under 4, and you have 32; write 2 for units in product, reserve 3, carry 4; slide, say $24 + 16 + 3 = 43$, write 3, carry 4; slide, $28 + 12 + 24 + 4 = 68$, or thus: 28, 40, 64, 68, write 8, carry 6 as before, and slide again, 20, 34, 52, 58, write 8, carry 5; slide, 10, 31, 36, write 6, carry 3; slide once more, 15, 18: you have the complete product.

REMARK.—Proceed towards the left until the multiplicand passes from under the multiplier, each time adding what you carry to the several products that stand one over the other, and the result will be the product.

MULTIPLICATION.

SLIDING METHOD.

EXAMPLE FIRST

$$\begin{array}{r} 5768 \\ 324 \\ \hline 1,868,832 \end{array}$$

Reverse the multiplier, thus: 423.

Reading products only.

423	
5768	32
423	
5768	$24 + 16 + 3 = 43$
423	
5768	$28 + 12 + 24 + 4 = 68$
423	
5768	$20 + 14 + 18 + 6 = 58$
423	
5768	$10 + 21 + 5 = 36$
423	
5768	$15 + 3 = 18$

EXAMPLE SECOND.

$$\begin{array}{r} 4658 \\ 623 \\ \hline 2,901,934 \end{array}$$

Reverse the multiplier, thus: 326.

326	
4658	24
326	
4658	$16 + 15 + 2 = 33$
326	
4658	$48 + 10 + 18 + 3 = 79$
326	
4658	$30 + 12 + 12 + 7 = 61$
326	
4658	$36 + 8 + 6 = 50$
326	
4658	$24 + 5 = 29$

CONTRACTIONS

—IN—

MULTIPLICATION.

Contractions can often be advantageously employed in business calculations ; but, like by-paths in a forest, they are convenient only to those who know the whole ground. Strangers will do better to keep the highway.

TO MULTIPLY BY ELEVEN.

RULE.—Add the figures in the multiplicand, after the first, from right to left.

APPLICATION 1.— 45×11 . $4 + 5 = 9$; place this sum between 4 and 5, thus 495.

35×11 . $3 + 5 = 8$; place this sum between 3 and 5, thus 385.

$$42 \times 11 = 462.$$

$$63 \times 11 = 693.$$

$$81 \times 11 = 891.$$

$$44 \times 11 = 484.$$

$$95 \times 11 = 1045.$$

$$49 \times 11 = 539.$$

CONTRACTIONS IN MULTIPLICATION.

APPLICATION 2.— 345×11 . Here we write 5; we say $4 + 5 = 9$ write 9; then $4 + 3 = 7$; write 7; then write 3, thus 3795.

254×11 . Write 4 for the first figure in the product; $4 + 5 = 9$, write 9 for the second figure; $5 + 2 = 7$ which is the third figure, and write 2 for the last figure, and we have 2794.

$$325 \times 11 = 3575.$$

$$127 \times 11 = 1397.$$

$$353 \times 11 = 3883.$$

$$272 \times 11 = 2992.$$

NOTE.—If the sum of two figures is over 9, carry the one to the next figure.

APPLICATION 3.— $58 \times 11 = 638$; here we write 8 as the first figure, and say $5 + 8 = 13$; write 3 for the middle figure, and carry the one to the next figure 5, making the product 638.

$$75 \times 11 = 825.$$

$$95 \times 11 = 1045.$$

$$385 \times 11 = 4235.$$

$$5863 \times 11 = 64493.$$

TO MULTIPLY TWO FIGURES BY TWO FIGURES WHEN
THE TENS ARE ALIKE.

To multiply 87 by 82.

Multiply units by units for the first figure of the product, the sum of the units by tens for the second figure, and tens by tens for the remaining figures, carrying when necessary.

$$87 \quad 7 \times 2 = 14, \text{ carry } 1.$$

$$82 \quad 8 \times (7 + 2) = 8 \times 9 = 72, \text{ and } 1 = 73.$$

$$7134 \quad 8 \times 8 = 64, \text{ and } 7 \text{ to carry} = 71.$$

Exercises.

$$81 \times 87$$

$$81 \times 87$$

$$116 \times 117$$

$$62 \times 63$$

$$47 \times 44$$

$$127 \times 122$$

$$54 \times 55$$

$$56 \times 52$$

$$107 \times 105$$

$$43 \times 41$$

$$79 \times 75$$

$$125 \times 122$$

$$27 \times 22$$

$$44 \times 43$$

$$113 \times 114$$

MULTIPLICATION.

CONTRACTIONS.

TO SQUARE ANY NUMBER OF NINES.

Rule.—Write from left to right as many nines, less one, as the given number contains, an 8, as many ciphers as nines, and 1.

Thus the
square
of

{	9 9 9	9 9 8 0 0 1
	9 9 9 9	9 9 9 8 0 0 0 1
	9 9 9 9 9	9 9 9 9 8 0 0 0 0 1

TO MULTIPLY BY ANY NUMBER OF NINES.

Rule.—Annex as many ciphers to the right of the multiplicand as there are nines in the multiplier, and from this number subtract the multiplicand; the remainder will be the product required.

EXAMPLE. — 37645×9999 .

$$\begin{array}{r}
 376450000 \\
 37645 \\
 \hline
 376412355
 \end{array}$$

The reason is obvious. By annexing four ciphers, we multiply the given number 10000 times; and by subtracting the given number, we have the product one less than 10000, or 9999 times the number.

TO MULTIPLY BY ANY NUMBER ENDING IN NINE.

Rule.—Multiply by the next higher number, and subtract the multiplicand.

EXAMPLE. — 42×39 .

$$\begin{array}{l}
 39 + 1 = 40 \\
 42 \times 40 = 1680 \quad \text{minus } 42 = 1638. \text{—Ans.}
 \end{array}$$

MULTIPLICATION.

CONTRACTIONS.

TO MULTIPLY BY ANY NUMBER FROM TWELVE
TO TWENTY.

Rule. — Multiply in regular succession the figures of the multiplicand by the unit's figure of the multiplier, and add to the product of each multiplication that figure in the multiplicand which stands next on the right of the one which you multiply ; add, also, the figure to carry, if any.

$$\begin{array}{r} \text{EXAMPLE. — } 36435 \\ \quad \quad \quad 13 \\ \hline 473655 \end{array}$$

Here we say $3 \times 5 = 15$; write down 5, carry 1 ; say $3 \times 3 + 1 + 5$, the figure which stands on the right of 3 = 15 ; write 5, carry 1 ; say $3 \times 4 + 1 + 3 = 16$; write 6 and carry 1 ; $3 \times 6 + 1 + 4 = 23$; write 3, carry 2 ; $3 \times 3 + 2 + 6 = 17$; write 7, carry 1 to 3 = 4.

TO MULTIPLY BY 21, 31, 41, 51, 61, 71, 81, 91.

Rule. — Write down the units figure of the multiplicand as the first figure of the product. Multiply in regular succession every figure in the multiplicand by the left hand figure of the multiplier, and to each product add the figure which stands next on the left of that which you multiply, and you have the required product.

EXAMPLE :

$$\begin{array}{r} 3725 \\ 21 \\ \hline 78225 \end{array} \quad \begin{array}{l} \text{Here we write the 5 as the units figure} \\ \text{in the multiplier ; then say } 5 \times 2 + 2 \\ = 12 ; \text{ write 2, carry 1 ; say } 2 \times 2 + 1 + \\ 7 = 12 ; \text{ write 2, carry 1 ; say } 2 \times 7 + 1 \\ + 3 = 18 : \text{ write 8, carry 1 ; then say} \\ \cdot \times 3 + 1 = 7, \text{ which completes the product.} \end{array}$$

MULTIPLICATION.

CONTRACTIONS.

TO MULTIPLY ANY NUMBERS OF TWO PLACES EACH,
WHEN THE UNITS OR TENS ARE ALIKE.

Rule. — Multiply units by units ; then, if the units are alike, multiply the sum of the tens, and the tens by the tens. If the tens are alike, multiply the sum of the units by the tens, and the tens by tens ; in all cases carrying as usual.

EXAMPLE 1 :

$$\begin{array}{r} 34 \\ 54 \\ \hline 1836 \end{array} \quad \begin{array}{l} 4 \times 4 = 16 ; \text{ write 6, carry 1.} \\ 5 + 3 \times 4 + 1 = 33 ; \text{ write 3, carry 3.} \\ 5 \times 3 + 3 = 18, \text{ which completes the} \\ \text{product.} \end{array}$$

EXAMPLE 2 :

$$\begin{array}{r} 45 \\ 43 \\ \hline 1938 \end{array} \quad \begin{array}{l} 5 \times 3 = 15 ; \text{ write 5, carry 1.} \\ 5 + 3 \times 4 + 1 = 33 ; \text{ write 3, carry 3.} \\ 4 \times 4 + 3 = 19, \text{ completes the product.} \end{array}$$

This rule will apply to the square of any number. It is the most useful of all contractions, and should be carefully studied.

TO MULTIPLY BY NUMBERS WHICH ARE FROM ONE
TO TWELVE LESS THAN ONE HUNDRED,
ONE THOUSAND, ETC.

Rule. — Multiply the multiplicand by the difference between the multiplier and 100, 1000, &c., and subtract the product from the product of the multiplicand by 100, 1000, &c.

EXAMPLE. — Multiply 35 by 98.

$$\begin{array}{l} 98 - 100 = 2. \\ 35 \times 2 = 70 \\ 35 \times 100 = 3500. \\ 3500 - 70 = 3430. \text{ — } Ans. \end{array}$$

When from 1 to 12 more than 100, add the product of the multiplicand by the unit figure, after annexing the required number of ciphers, thus :

EXAMPLE — Multiply 325 by 102.

$$\begin{array}{l} 325 \times 100 = 32500. \\ 325 \times 2 = 650 + 32500 = 33150. \end{array}$$

MULTIPLICATION.

CONTRACTIONS.

WHEN THE SUM OF THE UNITS IS TEN, AND THE TENS ARE ALIKE.

Method. — Multiply the units and write the result as the first two figures in the product. Then call the tens figure one more and write their product for the last two figures in the final product.

EXAMPLE.

$$\begin{array}{r} \times 6 \\ 84 \\ \hline \end{array} \quad \begin{array}{l} 4 \times 6 = 24. \\ 8 + 1 \times 8 = 72. \end{array}$$

7224

$$\begin{array}{r} 93 \quad 85 \quad 48 \quad 63 \quad 56 \quad 71 \quad 66 \\ 97 \quad 85 \quad 42 \quad 67 \quad 54 \quad 79 \quad 64 \\ \hline \end{array}$$

This contraction will only apply where the units equal ten and the tens are alike, as in above example. If the product of units does contain ten, as in 9×10 , the place of tens must be supplied with a cipher.

TO SQUARE ANY NUMBER ENDING IN FIVE.

Method. — Multiply the figure preceding the units as they will stand by the next higher number, and annex 25 to the product.

EXAMPLE.

$$\begin{array}{r} 75 \\ 75 \\ \hline \end{array} \quad \begin{array}{l} 7 + 1 \times 7 = 56. \\ \text{Annex 25.} \end{array}$$

5625

WHAT IS THE SQUARE OF

25? 35? 45? 75? 85? 95? 105? 115? 125?
135? 145? 155? 165? 175? 185? 195? 205?

MULTIPLICATION.

CONTRACTIONS.

TO FIND THE PRODUCT OF ANY TWO NUMBERS
WHOSE UNIT FIGURES ARE FIVE.

Method.—Take the product of the figures preceding the 5 in each number, increase this by one-half of the sum of these figures, and prefix the result to 25.

EXAMPLE.

$$\begin{array}{r} 25 \\ 45 \\ \hline 1125 \end{array} \quad 4 \times 2 + 3 = 11.$$

WHAT IS THE VALUE OF

$$\begin{array}{llll} 25 \times 45? & 55 \times 75? & 75 \times 95? & 65 \times 95? \\ 35 \times 85? & 85 \times 45? & 155 \times 35? & 165 \times 45? \\ 185 \times 65? & 175 \times 65? & 225 \times 105? & \end{array}$$

NOTE.—If the sum of the figures preceding the 5 is odd, when we take one-half of it, the one-half or five-tenths which remains must be added to the figure 2 of the 25; or we may take one-half of the next smaller number, and use 75 as the suffix.

TO MULTIPLY BY TWO FIGURES AT ONCE.

Rule.—Multiply both figures in the multiplier by each figure in the multiplicand separately.

NOTE.—When large numbers are to be multiplied, for the purpose of remembering which figure has been used, place a dot over each figure of the multiplicand as soon as multiplied.

EXAMPLE.

$$\begin{array}{r} 3265 \\ 24 \\ \hline 78360 \end{array} \quad \begin{array}{l} 5 \times 24 = 120 \\ 6 \times 24 + 12 = 156 \\ 2 \times 24 + 15 = 63 \\ 3 \times 24 + 6 = 78 \end{array}$$

To Multiply by Aliquot Parts of 100, 1000, Etc.

It is very important for an accountant to have a perfect knowledge of the table of Aliquot Parts of 100 and 1000. All goods sold at wholesale are bought and sold by these calculations, and those not familiar with the operation will often lose much valuable time in obtaining a correct result. By this method they can arrive at the result in one-tenth of the time, and are not so apt to make mistakes.

ALICUOT PARTS.

Of 10.

$$\begin{array}{lll} 2\frac{1}{2} = \frac{1}{4} & 1\frac{2}{3} = \frac{1}{6} & 1\frac{1}{4} = \frac{1}{8} \\ 3\frac{1}{3} = \frac{1}{3} & 1\frac{3}{7} = \frac{1}{7} & 1\frac{1}{9} = \frac{1}{9} \end{array}$$

Of 100.

$$\begin{array}{lll} 6\frac{1}{4} = \frac{1}{16} & 16\frac{2}{3} = \frac{1}{6} & 50 = \frac{1}{2} \\ 8\frac{1}{3} = \frac{1}{12} & 25 = \frac{1}{4} & 62\frac{1}{2} = \frac{1}{2} \text{ or } \frac{1-16}{1000} \\ 12\frac{1}{2} = \frac{1}{8} & 33\frac{1}{3} = \frac{1}{3} & 75 = \frac{3}{4} \\ 14\frac{2}{7} = \frac{1}{7} & 37\frac{1}{2} = \frac{8}{8} & 87\frac{1}{2} = \frac{7}{8} \\ & 18\frac{3}{4} = \frac{3}{16} & 31\frac{1}{4} = \frac{5}{16} \end{array}$$

Of 1000.

$$\begin{array}{lll} 83\frac{1}{3} = \frac{1}{12} & 166\frac{2}{3} = \frac{1}{6} & 333\frac{1}{3} = \frac{1}{3} \\ 125 = \frac{1}{8} & 250 = \frac{1}{4} & 375 = \frac{3}{8} \end{array}$$

$$625 = \frac{1}{8} \text{ or } 1-16 \text{ of } 10,000.$$

$$833\frac{1}{3} = \frac{1}{6} \text{ or } 1-16 \text{ of } 1,000. \quad 875 = \frac{7}{8}.$$

EXAMPLE 1.—Multiply 464 by 25 = 11600.

$$\begin{array}{r} 4 \overline{) 46400} \\ 11600 \end{array}$$

This is, in effect, the same as to multiply by 100 we divide by 4 because 25 is $\frac{1}{4}$ of 100, which is the same as multiplying by 25. In the same manner, annex two ciphers and divide by 2 multiplies by 50; annex two ciphers and divide by 8 multiplies by $12\frac{1}{2}$; or annex two ciphers and divide by 8 to multiply by 125, etc.. etc.

This same principle may be applied in any Aliquot Part of 10, 100, 1000, as shown in preceding table.

RULE.—Add ciphers to the multiplicand and divide by the number, as the multiplier is a part of 100 or 1000. When the multiplicand is a mixed number, reduce the fraction to a decimal and proceed as before.

EXAMPLE 1.—Multiply 434 by $2\frac{1}{2}$.

$$\begin{array}{r} 4 \overline{) 43400} \\ 10850 \end{array}$$

EXAMPLE 2.—Multiply 535 by 25.

$$\begin{array}{r} 4 \overline{) 53500} \\ 13375 \end{array}$$

EXAMPLE 3.—Multiply 5642 by $3\frac{1}{2}$.

$$\begin{array}{r} 3 \overline{) 56420} \\ 18806\frac{2}{3} \end{array}$$

EXAMPLE 4.—Multiply 4321 by $33\frac{1}{3}$.

$$\begin{array}{r} 3 \overline{) 432100} \\ 144033\frac{2}{3} \end{array}$$

EXAMPLE 5.—Multiply 1234 by $1\frac{1}{2}$.

$$\begin{array}{r} 6 \overline{) 12340} \\ 2056\frac{2}{3} \end{array}$$

EXAMPLE 6 — Multiply 2245 by $1\frac{2}{3}$.

$$\begin{array}{r} 7 \overline{) 22450} \\ 3207\frac{1}{2} \end{array}$$

EXAMPLE 7.— Multiply 4456 by $1\frac{1}{4}$.

$$\begin{array}{r} 8 \overline{) 44560} \\ 5570 \end{array}$$

EXAMPLE 8.— Multiply 5644 by $1\frac{1}{2}$.

$$\begin{array}{r} 9 \overline{) 56440} \\ 6271\frac{1}{2} \end{array}$$

EXAMPLE 9.— Multiply 4324 by $6\frac{1}{4}$.

$$\begin{array}{r} 16 \overline{) 432400} \\ 27025 \end{array}$$

EXAMPLE 10.— Multiply 5642 by $8\frac{1}{2}$.

$$\begin{array}{r} 12 \overline{) 564200} \\ 47016\frac{2}{3} \end{array}$$

EXAMPLE 11.— Multiply 5648 by $12\frac{1}{2}$.

$$\begin{array}{r} 8 \overline{) 564800} \\ 70600 \end{array}$$

EXAMPLE 12.— Multiply 6843 by $14\frac{2}{3}$.

$$\begin{array}{r} 7 \overline{) 684300} \\ 97757\frac{1}{2} \end{array}$$

EXAMPLE 13.— Multiply 7824 by $16\frac{1}{2}$.

$$\begin{array}{r} 6 \overline{) 782400} \\ 130400 \end{array}$$

EXAMPLE 14.— Multiply 7846 by $83\frac{1}{2}$.

$$\begin{array}{r} 12 \overline{) 7846000} \\ 653833\frac{1}{2} \end{array}$$

EXAMPLE 15.—Multiply 7896 by 125

$$\frac{1}{8} \text{ of } 1000. \quad 8 \overline{) 7896000} \\ 987000.$$

EXAMPLE 16.—Multiply 1246 by 166 $\frac{2}{3}$.

$$\frac{1}{3} \text{ of } 1000. \quad 6 \overline{) 1246000} \\ 207666\frac{2}{3}$$

EXAMPLE 17.—Multiply 8453 by 250.

$$\frac{1}{4} \text{ of } 100. \quad 4 \overline{) 8453000} \\ 2113250$$

EXAMPLE 18.—Multiply 4642 by 625.

$$\frac{1}{16} \text{ of } 10000. \quad 16 \overline{) 46420000} \\ 2901250$$

or,

$$\frac{5}{8} \text{ of } 1000. \quad 8 \overline{) 4642000} \\ 580250 \\ 5 \\ \hline 2901250$$

EXAMPLE 19.—Multiply 5642 by 833 $\frac{1}{3}$.

$$\frac{1}{12} \text{ of } 10000. \quad 12 \overline{) 56420000} \\ 4701666\frac{2}{3}$$

or,

$$\frac{5}{6} \text{ of } 1000. \quad 6 \overline{) 5642000} \\ 940333\frac{1}{3} \\ 5 \\ \hline 4701666\frac{2}{3}$$

EXAMPLE 20.—Multiply 1342 by 875.

$$\frac{7}{8} \text{ of } 1000. \quad 8 \overline{) 1342000} \\ 167750 \\ 7 \\ \hline 1174250$$

APPLICATION OF THE TABLE OF ALIQUOT PARTS.

In order to give an idea of rapid calculation in multiplication, a few examples will here be given, and from these others may be created without limit by anyone :

85 yards cloth @ \$2.50. Add one cipher and divide by 4. Answer, $87\frac{1}{2}$ or \$87.50.

216 yards cloth @ \$2.25. Multiply $22\frac{1}{4}$ by $\begin{array}{r} 432 \\ 54 \\ \hline \end{array}$ setting down the amounts thus : $\begin{array}{r} 432 \\ 54 \\ \hline \$486 \end{array}$

48 yards cloth @ \$2.12 $\frac{1}{2}$. Multiply by $22\frac{1}{2}$ in same manner as by $22\frac{1}{4}$.

55 yards cloth @ \$1.95. Move decimal point in price two places to the right, divide 195 by 2 and add $\frac{1}{10}$ thus : $\begin{array}{r} 97.50 \\ 9.75 \\ \hline \$107.25 \end{array}$

162 yards cloth @ \$1.80. Multiply by 2 and deduct $\frac{1}{10}$ thus : $\begin{array}{r} 324 \\ 32.40 \\ \hline \$291.60 \end{array}$

86 yards cloth @ \$1.75. Multiply by 2 and deduct $\frac{1}{8}$, thus : $\begin{array}{r} 72 \\ 9 \\ \hline \$63 \end{array}$

29 yards cloth @ \$1.62 $\frac{1}{2}$. Add $\frac{1}{8}$ and $\frac{1}{8}$ to the whole, thus : $\begin{array}{r} 29 \\ 14.50 \\ 3.62\frac{1}{2} \\ \hline \$47.12 \end{array}$

114 $\frac{1}{2}$ yards cloth @ \$1.50. Add $\frac{1}{2}$, thus : $\begin{array}{r} 114.50 \\ 57.25 \\ \hline \$171.75 \end{array}$

37 $\frac{3}{4}$ yards cloth @ \$1.25. Add $\frac{1}{4}$, thus : $\begin{array}{r} 37.75 \\ 9.44 \\ \hline \$47.19 \end{array}$

83 yards cloth @ \$1.20. Add $\frac{1}{5}$, thus : $\begin{array}{r} 83 \\ 16.60 \\ \hline \$99.60 \end{array}$

APPLICATION OF THE TABLE OF ALIQUOT PARTS.

50 yards cloth @ \$1.18. Find $\frac{1}{2}$ of \$118 = \$59.

75 yards cloth @ \$1.14. Deduct from \$114	114
$\frac{1}{4}$ of that amount, thus :	28.50
	\$85.50

24 yards cloth @ 95c. Deduct $\frac{1}{2}$ from \$24,	24
thus :	1.20
	\$22.80

68 $\frac{1}{2}$ yards cloth @ 75c. Deduct $\frac{1}{4}$, thus :	68.50
	17.12
	\$51.38

46 yards cloth @ 55c. Find $\frac{1}{2}$ and add to	23
same $\frac{1}{10}$, thus :	2.80
	\$25.80

32 yards cloth @ 45c. Find $\frac{1}{2}$ and deduct	16
$\frac{1}{10}$, thus :	1.60
	\$14.40

96 yards cloth @ 25c. Find $\frac{1}{4}$ of \$96 = \$24.

The reason for making the computations in this manner will at once be apparent, from the fact that when the price is either more or less than \$1, the fractional part of a dollar is either taken from, or added to, the amount that sum would be if @ \$1 per yard. It is sometimes more convenient to call the number of yards the price, and the price the number of yards, in order to make the computation, as in the example above ; 50 yards @ \$1.18 would be the same as 118 yards @ 50c. ; or to say, if 100 yards @ \$1.18 would be \$118, 50 yards would be half of that amount, or \$59. In the first example we say, if 35 yards @ \$10 per yard would be \$350, at \$2.50 per yard it would be one-fourth of that amount, or \$87.50.

It is of course expected that the student will perform these operations in his mind. Nothing is more desirable for an Entry Clerk or Book-keeper than to have a thorough knowledge of the aliquot parts of 100 or 1000. Many remunerative situations have been obtained by those who thoroughly understood the practice, though their general education was very limited. Constant practice will enable anyone to give the products as fast as the questions are given.

Another mode of multiplying, when the multiplier can be divided into factors, is an improvement on the common method ; but to multiply in a single line is still better. The objection to this method is that when an error occurs in the first line it will run into the second.

EXAMPLE : —

$$\begin{array}{r}
 1234 \\
 124 \\
 \hline
 4936 \\
 14808 \\
 \hline
 153016
 \end{array}$$

Here we multiply through by 4 ; now, since 12 is 3 times 4, if we multiply the first line by 3 we have the product of 12 in a single line. Quite a variety of examples can be worked in this way.

HOW TO PROVE MULTIPLICATION BY CASTING OUT THE NINES.

RULE.—Find out the excess over nine in your multiplicand and multiplier, and if the excess in the product of these excesses is the same as the excess in the product, the operation is correct.

EXAMPLE : —

$$\begin{array}{r}
 1234 \\
 124 \\
 \hline
 153016
 \end{array}
 \quad
 \begin{array}{r}
 1 \\
 7 \\
 \hline
 7
 \end{array}
 \quad
 \begin{array}{r}
 7 \\
 7 \times 1 \\
 7
 \end{array}$$

MULTIPLICATION

—BY—

SQUARING NUMBERS.

$1^2 = 1$	$12 = 144$
$2^2 = 4$	$13^2 = 169$
$3^2 = 9$	$14^2 = 196$
$4^2 = 16$	$15^2 = 225$
$5^2 = 25$	$16^2 = 256$
$6^2 = 36$	$17^2 = 289$
$7^2 = 49$	$18^2 = 324$
$8^2 = 64$	$19^2 = 361$
$9^2 = 81$	$20^2 = 400$
$10^2 = 100$	$21^2 = 441$
$11^2 = 121$	$22^2 = 484$

NOTE.—The product of any two numbers is equal to the square of the mean, minus the square of half their difference. The *mean* is a number as much greater than the less, as it is less than the greater.

RULE.—From the square of the mean subtract the square of the difference between either of the given numbers and the mean.

EXAMPLE 1.

$$\begin{array}{r}
 17 \\
 13 \\
 \hline
 221
 \end{array}
 \quad
 15^2 - 4 = 221$$

REMARK.—15 is as much greater than 13 as it is less than 17, 15 is therefore the mean between 17 and 13. Half the difference is 2, the square of 2 is 4; or, we may say, the difference between the mean and either of the given numbers is 2, square of which is 4.

EXAMPLE 2.—What cost 19 books at 13 cts. each?

SOLUTION.—The mean of 13 and 19 is 16, the square of which is 256—9, the square of *half* the difference of the given numbers = 245.

EXAMPLE 3.—What cost 13 tons of hay at \$14.00 a ton?

$$\text{Thus:} \quad 13^2 + 13 = 182$$

Where the difference of two numbers is a unit, we add the less number to its square, for

$$13 \times 13 = 14 \text{ times } 13.$$

EXAMPLE 4.—What cost 16 ounces of gold dust at \$17.00 an ounce?

$$\text{Thus:} \quad 16^2 + 16 = 272.$$

Table of Square Numbers continued.

	$26^2 = 676$
	$27^2 = 729$
$23^2 = 529$	$28^2 = 784$
$24^2 = 576$	$29^2 = 841$
$25^2 = 625$	$30^2 = 900$

Here let the student observe that the two right-hand figures in the square of any number, as much less than 25 as another is greater, are the same in one case as in the other. For example, in the squares of 23 and 27, the one as much less as the other is greater than 25, the two right-hand figures are the same. This law holds true in all cases.

EXAMPLE 1.—What cost 23 shad at 27 cts. each?

$$25^2 - 4 = 621.$$

EXAMPLE 2.—What cost 26 tons of hay at \$27.00 a ton?

$$26^2 + 26 = 703$$

Table of Square Numbers continued.

$31^2 = 961$	$19^2 = 361$
$32^2 = 1024$	$18^2 = 324$
$33^2 = 1089$	$17^2 = 289$
$34^2 = 1156$	$16^2 = 256$
$35^2 = 1225$	$15^2 = 225$
$36^2 = 1296$	$14^2 = 196$
$37^2 = 1369$	$13^2 = 169$
$38^2 = 1444$	$12^2 = 144$
$39^2 = 1521$	$11^2 = 121$
$40^2 = 1600$	$10^2 = 100$

The first column is placed here to afford the student an opportunity of observing that the *two right-hand figures* in the square of any number which is as much less than 25 as the other is greater, are the same in the former case as in the latter; or, which is the same thing, the two right-hand figures in the square of any number as much *less* than 20 as another is *greater* than 30 are the same in one case as in the other.

Table of Squares continued.

$41^2 = 1681, 9^2$	$46^2 = 2116, 4^2$
$42^2 = 1764, 8^2$	$47^2 = 2209, 3^2$
$43^2 = 1849, 7^2$	$48^2 = 2304, 2^2$
$44^2 = 1936, 6^2$	$49^2 = 2401, 1^2$
$45^2 = 2025, 5^2$	$50^2 = 2500, 0^2$

The student need have no difficulty in remembering the squares in the above columns. Observe that the two right-hand figures in the square are in every instance the square of the difference between the units figure of the root and 10; the two left-hand figures in the square will also be easily remembered if we observe that the number is formed by adding 1 less than the right-hand or units figure of the root

to the square of the left-hand, or tens figure ; thus, in the square of 47 the left-hand figures are 22, or 1 less than 7 added to the square of 4, thus :

$$4^2 = 16 + (7 - 1) = 22.$$

The right-hand figures are obtained by subtracting 7 from 10 = 3 ; the square of 3 = 9

NOTE.—When the square of the difference between right-hand figures and ten is not over 9, prefix a cipher, as in above case.

EXAMPLE 2.— $43^2 = 10 - 3 = 7^2 = 49$, right-hand figures ; $4 \times 4 + 2 = 18$, left-hand figures ; therefore $43^2 = 1849$.

Table of Squares continued.

$51^2 = 2601$	$56^2 = 3136$
$52^2 = 2704$	$57^2 = 3249$
$53^2 = 2809$	$58^2 = 3364$
$54^2 = 2916$	$59^2 = 3481$
$55^2 = 3025$	$60^2 = 3600$

This square can also easily be remembered if we observe that the left-hand figures in every instance may be produced by adding the right-hand figure of the root to the square of the left-hand figure, and the number expressed by the two right-hand figures in the square, is the square of the right-hand figures in the root.

Example, square 56. Here we say $6^2 = 36$, which are the right-hand figures in the square. Again, $5^2 + 6 = 31$, which are the left hand figures in the square.

Table of Squares continued.

$61^2 = 3721$	$11^2 = 121$	$70^2 = 4900$	$24^2 = 576$
$62^2 = 3844$	$12^2 = 144$	$71^2 = 5041$	$25^2 = 625$
$63^2 = 3969$	$13^2 = 169$	$72^2 = 5184$	$26^2 = 676$
$64^2 = 4096$	$14^2 = 196$	$73^2 = 5329$	$27^2 = 729$
$65^2 = 4225$	$15^2 = 225$	$74^2 = 5476$	$28^2 = 784$

$66 = 4356$	$16^2 = 256$	$75^2 = 5625$	$29^2 = 841$
$67^2 = 4489$	$17^2 = 289$	$76^2 = 5776$	$30^2 = 900$
$68^2 = 4624$	$18^2 = 324$	$77^2 = 5929$	$21^2 = 441$
$69^2 = 4761$	$19^2 = 361$	$78^2 = 6084$	$22^2 = 484$
$70^2 = 4900$	$20^2 = 400$	$79^2 = 6241$	$23^2 = 529$
		$80^2 = 6400$	

In the above tables the columns of squares on the right are thus placed with their roots, in order that the student may associate them with the squares of the left-hand column. He will of course observe that two figures (units and tens) are in regular succession, the same in one column as in the other. In the following columns the same principle will be observed.

$81^2 = 6561$	$19^2 = 361$	$91^2 = 8281$	$9^2 = 81$
$82^2 = 6724$	$18^2 = 324$	$92^2 = 8464$	$8^2 = 64$
$83^2 = 6889$	$17^2 = 289$	$93^2 = 8649$	$7^2 = 49$
$84^2 = 7056$	$16^2 = 256$	$94^2 = 8836$	$6^2 = 36$
$85^2 = 7225$	$15^2 = 225$	$95^2 = 9025$	$5^2 = 25$
$86^2 = 7396$	$14^2 = 196$	$96^2 = 9216$	$4^2 = 16$
$87^2 = 7569$	$13^2 = 169$	$97^2 = 9409$	$3^2 = 9$
$88^2 = 7744$	$12^2 = 144$	$98^2 = 9604$	$2^2 = 4$
$89^2 = 7921$	$11^2 = 121$	$99^2 = 9801$	$1^2 = 1$
$90^2 = 8100$	$10^2 = 100$	$100^2 = 10000$	$0^2 = 0$

The square of last column may be obtained by adding twice the right-hand figure of the root to 80, thus: $91^2 = 2 \times 1 = 2 + 80 = 82$.

EXAMPLE 2.— $99^2 = 80 + 18 = 98$, left-hand figures in the square.

TO SQUARE ANY NUMBER ENDING IN 5.

RULE.—Multiply the part preceding the units by itself, increase by a unit and prefix the product to 25, thus: $65^2 = 6 \times 7 = 42$; prefix 25 = 4225.

EXAMPLE 2.— $72^2 = 7 \times 8 = 56$; prefix 25 = 5625.

DIVISION.

The work in division can be abbreviated by not writing out the product figures, and finding the remainders as we pass along.

RULE. — Subtract each product figure as it is formed (that is, the right-hand figure of the product), and when it is greater than the figure from which you subtract, carry one more to the next product figure than you would otherwise carry.

EXAMPLE: —

$$\begin{array}{r} 29 \) \ 15341 \ (\ 529 \\ \underline{8} \\ 26 \end{array}$$

Say $5 \times 9 = 45$. 5 from 13 = 8; then $5 \times 2 + 4 + 1 = 15$. Our next quotient figure is 2; now say $2 \times 9 = 18$; 8 from 14 = 6; $2 \times 2 + 1 + 1 = 6$, subtracted from 8 leaves 2, or 26, our next, etc.

The Italian method of dividing is to place the divisor to the right of the dividend, and the quotient underneath it. The advantage in this is, you bring the operation closer together and can readily multiply the quotient by the divisor, to prove the work.

EXAMPLE: —

$$\begin{array}{r} 15341 \ (\ 29 \\ \underline{8} \quad 529 \\ 26 \end{array}$$

CONTRACTIONS IN DIVISION.

The table of Aliquot Parts on page 25 can be applied to division.

To divide by 25 multiply the dividend by 4 and point off two figures to the right-hand of the product as so many hundredths, or take one-fourth of the two right-hand figures of the product as so many twenty-fifths.

EXAMPLE 1.— Divide 3757 by 25.

$$\begin{array}{r} 3757 \\ 4 \\ \hline 15028 \end{array} \text{ or, } 150\frac{2}{5}$$

EXAMPLE 2.— Divide 437924 by 125.

$$\begin{array}{r} 437924 \\ 8 \\ \hline 3503392 \end{array} = 35033\frac{4}{125}$$

This method will hold good through the entire table of Aliquot Parts. It is simply the reverse of multiplication. Another convenient mode of dividing is to reduce the divisor into factors.

EXAMPLE.— Divide 34569 by 24.

$$24 = 6 \times 4$$

$$\begin{array}{r} 6 \overline{) 34569} \\ 4 \overline{) 5761} - 3 \text{ over.} \\ 1440 - 1 \text{ over.} \end{array}$$

$$6 \times 1 + 3 = 9 \text{ true remainder.}$$

$$\begin{array}{r} \text{or, } 4 \overline{) 34569} \\ 6 \overline{) 8642} - 1 \\ 1440 - 2 \end{array}$$

$$2 \times 4 + 1 = 9 \text{ true remainder.}$$

FRACTIONS.

A *Proper Fraction* is one whose value is less than a unit, as $\frac{2}{3}$, $\frac{3}{4}$.

An *Improper Fraction* is one whose value is equal to or more than a unit, as $\frac{4}{3}$, $\frac{5}{2}$.

A *Mixed Fraction* consists of a whole number and a fraction, as $2\frac{1}{4}$, $4\frac{1}{2}$.

1.—Multiplying the numerator of a fraction by any number multiplies the value of the fraction by that number.

2.—Dividing the numerator of a fraction by any number divides the value of the fraction by that number.

3.—Multiplying the denominator of a fraction by any number divides the value of the fraction by that number.

4.—Dividing the denominator of a fraction by any number multiplies the value of the fraction by that number.

5.—Multiplying both numerator and denominator of a fraction by any number does not change the value of the fraction.

6.—Dividing both numerator and denominator of a fraction by any number does not change the value of the fraction.

To Higher Terms

How many fourths in $\frac{1}{2}$?

SOLUTION. — In 1 there are $\frac{1}{4}$, and in $\frac{1}{2}$ there are $\frac{1}{2}$ of $\frac{1}{4}$, or $\frac{2}{4}$.

How many sixths in	$\frac{1}{2}$?	$\frac{1}{3}$?	$\frac{2}{3}$?	$\frac{3}{3}$?
How many eighths in	$\frac{1}{2}$?	$\frac{1}{4}$?	$\frac{2}{4}$?	$\frac{3}{4}$?
How many tenths in	$\frac{1}{2}$?	$\frac{1}{5}$?	$\frac{2}{5}$?	$\frac{3}{5}$?
How many twelfths in	$\frac{1}{2}$?	$\frac{1}{6}$?	$\frac{2}{6}$?	$\frac{3}{6}$?
How many fourteenths in	$\frac{1}{2}$?	$\frac{1}{7}$?	$\frac{2}{7}$?	$\frac{3}{7}$?
How many fifteenths in	$\frac{1}{2}$?	$\frac{1}{8}$?	$\frac{2}{8}$?	$\frac{3}{8}$?
How many sixteenths in	$\frac{1}{2}$?	$\frac{1}{9}$?	$\frac{2}{9}$?	$\frac{3}{9}$?
How many eighteenthths in	$\frac{1}{2}$?	$\frac{1}{10}$?	$\frac{2}{10}$?	$\frac{3}{10}$?
How many twentieths in	$\frac{1}{2}$?	$\frac{1}{11}$?	$\frac{2}{11}$?	$\frac{3}{11}$?

To Lower Terms.

How many thirds are equal to $\frac{1}{6}$?

SOLUTION. — $\frac{1}{6}$ is equal to $\frac{2}{12}$, therefore $\frac{1}{6}$ of the number of sixths equals the number of thirds; $\frac{1}{6}$ of 4 is 2.

How many halves in	$\frac{1}{2}$?	$\frac{1}{4}$?	$\frac{1}{8}$?	$\frac{1}{16}$?
How many thirds in	$\frac{1}{3}$?	$\frac{1}{6}$?	$\frac{1}{9}$?	$\frac{1}{12}$?
How many fourths in	$\frac{1}{4}$?	$\frac{1}{8}$?	$\frac{1}{12}$?	$\frac{1}{16}$?
How many sixths in	$\frac{1}{6}$?	$\frac{1}{12}$?	$\frac{1}{18}$?	$\frac{1}{24}$?
How many eighths in	$\frac{1}{8}$?	$\frac{1}{16}$?	$\frac{1}{24}$?	$\frac{1}{32}$?
How many fifths in	$\frac{1}{5}$?	$\frac{1}{10}$?	$\frac{1}{15}$?	$\frac{1}{20}$?
How many sevenths in	$\frac{1}{7}$?	$\frac{1}{14}$?	$\frac{1}{21}$?	$\frac{1}{28}$?
How many ninths in	$\frac{1}{9}$?	$\frac{1}{18}$?	$\frac{1}{27}$?	$\frac{1}{36}$?
How many tenths in	$\frac{1}{10}$?	$\frac{1}{20}$?	$\frac{1}{30}$?	$\frac{1}{40}$?

To a Common Denominator.

When fractions have the same denominator, they are said to have a *Common Denominator*.

Ex. — Reduce $\frac{2}{3}$ and $\frac{3}{4}$ to a common denominator.

SOLUTION. — A common denominator for 3ds and 4ths is 12ths; in 1 there are $\frac{1}{12}$, and in $\frac{2}{3}$ there are $\frac{2}{3}$ of $\frac{1}{12}$, or $\frac{8}{12}$; and in $\frac{3}{4}$ there are $\frac{3}{4}$ of $\frac{1}{12}$, or $\frac{9}{12}$.

Reduce $\frac{1}{4}$ and $\frac{1}{5}$ to a common denominator.

Reduce $\frac{1}{3}$ and $\frac{1}{5}$ to a common denominator.

Addition of Fractions.

What is the sum of $\frac{2}{3}$ and $\frac{3}{4}$?

SOLUTION.— $\frac{2}{3}$ equals $\frac{8}{12}$, and $\frac{3}{4}$ equals $\frac{9}{12}$; $\frac{8}{12}$ plus $\frac{9}{12}$ are $\frac{17}{12}$, which equals $1\frac{5}{12}$.

What is the sum

Of $\frac{1}{4}$ and $\frac{1}{9}$?	Of $\frac{2}{5}$ and $\frac{3}{7}$?
Of $\frac{2}{8}$ and $\frac{3}{5}$?	Of $\frac{5}{6}$ and $\frac{4}{7}$?
Of $\frac{3}{7}$ and $\frac{4}{8}$?	Of $2\frac{1}{2}$ and $3\frac{1}{8}$?
Of $3\frac{1}{3}$ and $4\frac{1}{4}$?	Of $2\frac{2}{3}$ and $1\frac{3}{4}$?
Of $3\frac{1}{4}$ and $2\frac{3}{8}$?	Of $6\frac{2}{3}$ and $5\frac{3}{8}$?
Of $4\frac{1}{6}$ and $5\frac{1}{7}$?	Of $6\frac{1}{2}$ and $5\frac{1}{8}$?
Of $7\frac{2}{3}$ and $8\frac{3}{7}$?	Of $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{3}{4}$?
Of $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$?	Of $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$?

Subtraction of Fractions.

What is the difference between $\frac{3}{4}$ and $\frac{2}{3}$?

SOLUTION.— $\frac{3}{4}$ is equal to $\frac{9}{12}$, and $\frac{2}{3}$ is equal to $\frac{8}{12}$; $\frac{9}{12}$ minus $\frac{8}{12}$ equals $\frac{1}{12}$.

Subtract

$\frac{2}{3}$ from $\frac{4}{5}$?	$\frac{2}{5}$ from $\frac{3}{8}$?	$\frac{3}{5}$ from $\frac{3}{4}$?
$\frac{3}{4}$ from $\frac{8}{9}$?	$\frac{1}{6}$ from $\frac{1}{5}$?	$\frac{1}{7}$ from $\frac{1}{6}$?
$\frac{1}{3}$ from $\frac{5}{8}$?	$\frac{2}{5}$ from $\frac{2}{3}$?	$\frac{1}{2}$ from $\frac{5}{7}$?
$\frac{1}{8}$ from $\frac{1}{7}$?	$\frac{1}{9}$ from $\frac{1}{2}$?	$\frac{2}{7}$ from $\frac{2}{3}$?
$\frac{3}{7}$ from $\frac{8}{9}$?	$2\frac{1}{2}$ from $3\frac{1}{4}$?	$3\frac{1}{5}$ from $4\frac{1}{4}$?
$2\frac{1}{4}$ from $3\frac{1}{6}$?	$3\frac{1}{5}$ from $5\frac{1}{6}$?	

Multiplication of Fractions.

How many are 4 times $\frac{3}{8}$?

SOLUTION.—4 times $\frac{3}{8}$ are $\frac{12}{8}$, which equals $\frac{3}{2}$ or $1\frac{1}{2}$.

How many are 3 times $\frac{2}{3}$?	3 times $\frac{2}{9}$?
How many are 4 times $\frac{6}{8}$?	5 times $\frac{4}{10}$?
How many are 7 times $\frac{3}{4}$?	3 times $\frac{2}{6}$?
How many are 4 times $\frac{6}{12}$?	6 times $\frac{2}{12}$?
How many are 3 times $\frac{6}{9}$?	4 times $\frac{2}{6}$?
How many are 8 times $\frac{2}{4}$?	8 times $\frac{3}{6}$?
How many are 5 times $\frac{3}{6}$?	5 times $\frac{7}{7}$?

Division of Fractions.

How many times is $\frac{2}{3}$ contained in 4?

SOLUTION.—1 contained in 4, 4 times; and if 1 is contained in 4, 4 times, $\frac{1}{2}$ is contained in 4, 8 times 4 times, which are 12 times, and 2 thirds is contained in 4 $\frac{1}{2}$ of 12 times, or 6 times.

How many times is $\frac{3}{4}$ contained in 2? In 3?

How many times is $\frac{2}{3}$ contained in 3? In 5?

How many times is $\frac{3}{4}$ contained in 2? In 4?

How many times is $\frac{2}{3}$ contained in 5? In 7?

How many times is $\frac{1}{2}$ contained in 4? In 5?

How many times is $\frac{3}{8}$ contained in 2? In 4?

How many times is $\frac{1}{2}$ contained in $\frac{3}{4}$?

SOLUTION.— $\frac{1}{2}$ is equal to $\frac{10}{20}$, and $\frac{3}{4}$ is equal to $\frac{15}{20}$; $\frac{10}{20}$ is contained as many times in $\frac{15}{20}$ as 10 is contained 15, which is $\frac{3}{2}$ or $\frac{3}{2}$ times.

How many times is $\frac{3}{4}$ contained in $\frac{2}{3}$?

How many times is $\frac{2}{3}$ contained in $\frac{3}{4}$?

How many times is $\frac{1}{2}$ contained in $\frac{3}{4}$?

How many times $\frac{3}{4}$ is $\frac{1}{2}$? $\frac{1}{2}$? $\frac{3}{8}$?

How many times $\frac{3}{8}$ is $\frac{1}{2}$? $\frac{3}{8}$? $\frac{9}{16}$?

Relation of Fractions.

What part of 2 is $\frac{3}{4}$?

SOLUTION.—1 is $\frac{1}{2}$ of 2; and, if 1 is $\frac{1}{2}$ of 2, $\frac{1}{4}$ is $\frac{1}{4}$ of 2, which is $\frac{1}{2}$ of 2, and $\frac{3}{4}$ is 3 times $\frac{1}{4}$, or $\frac{3}{8}$ of 2.

What part of 3 is $\frac{2}{3}$? Of 2 is $\frac{3}{4}$?

What part of 4 is $\frac{2}{3}$? Of 5 is $\frac{3}{5}$?

What part of 4 is $\frac{1}{2}$? Of 7 is $\frac{5}{8}$?

What part of 9 is $\frac{3}{7}$? Of 5 is $\frac{1}{2}$ of $\frac{3}{4}$?

What part of 6 is $\frac{2}{3}$ of $\frac{1}{4}$? Of 7 is $\frac{2}{3}$ of $\frac{3}{2}$?

What part of $\frac{2}{3}$ is $\frac{1}{2}$?

SOLUTION.— $\frac{1}{2}$ is $\frac{1}{2}$ of $\frac{2}{3}$, and $\frac{3}{4}$, or *one*, is 3 times $\frac{1}{4}$, or $\frac{3}{4}$ of $\frac{2}{3}$. Since *one* is $\frac{3}{4}$ of $\frac{2}{3}$, $\frac{1}{2}$ is $\frac{1}{2}$ of $\frac{3}{4}$, which is $\frac{1}{2}$ of $\frac{3}{4}$, and $\frac{1}{2}$ is 4 times $\frac{1}{8}$, which are $\frac{1}{2}$, or $\frac{1}{2}$ of $\frac{2}{3}$.

What part of $\frac{3}{4}$ is $\frac{2}{3}$? Of $\frac{3}{8}$ is $\frac{2}{3}$? Of $\frac{1}{2}$ is $\frac{5}{6}$?

What part of $\frac{6}{7}$ is $\frac{1}{2}$? Of $\frac{2}{5}$ is $\frac{3}{4}$? Of $\frac{3}{5}$ is $\frac{3}{4}$?

Reducing to Fractions.

What is $\frac{1}{2}$ of 4?

SOLUTION.— $\frac{1}{2}$ of 1 is $\frac{1}{2}$, and if $\frac{1}{2}$ of 1 is $\frac{1}{2}$, $\frac{1}{2}$ of 4 is 4 times $\frac{1}{2}$, which are 2.

What is

$\frac{1}{2}$ of 5? $\frac{1}{4}$ of 6? $\frac{1}{3}$ of 7? $\frac{1}{5}$ of 9?
 $\frac{1}{2}$ of 5? $\frac{1}{4}$ of 10? $\frac{1}{7}$ of 12? $\frac{1}{8}$ of 20?
 $\frac{1}{10}$ of 24? $\frac{1}{12}$ of 32? $\frac{2}{3}$ of 6? $\frac{3}{4}$ of 10?

What is $\frac{2}{3}$ of $\frac{3}{4}$?

SOLUTION.— $\frac{1}{3}$ of $\frac{3}{4}$ is $\frac{1}{4}$, and if $\frac{1}{3}$ of $\frac{3}{4}$ is $\frac{1}{4}$, $\frac{2}{3}$ of $\frac{3}{4}$ are 2 times $\frac{1}{4}$, which are $\frac{1}{2}$, or $\frac{2}{4}$.

What is

$\frac{2}{3}$ of $\frac{1}{2}$? $\frac{2}{7}$ of $\frac{7}{8}$? $\frac{3}{8}$ of $\frac{8}{9}$? $\frac{1}{2}$ of $\frac{3}{4}$?
 $\frac{3}{8}$ of $\frac{1}{2}$? $\frac{2}{7}$ of $\frac{1}{4}$? $\frac{3}{8}$ of $\frac{1}{2}$?

What is $\frac{1}{3}$ of $\frac{1}{4}$?

SOLUTION.— $\frac{1}{4}$ is one of the 4 equal parts into which a unit may be divided; if we divide each *fourth* into 3 equal parts, each part is $\frac{1}{3}$ of $\frac{1}{4}$, and since there are 4 times 3, or 12 parts in all, each part is $\frac{1}{12}$ of a unit?

ANOTHER SOLUTION.— $\frac{1}{4}$ equals $\frac{3}{12}$, and $\frac{1}{3}$ of $\frac{3}{12}$ is $\frac{1}{12}$. This is a simpler solution, but not so explanatory.

What is $\frac{1}{2}$ of $\frac{1}{4}$? $\frac{1}{4}$ of $\frac{1}{4}$? $\frac{1}{5}$ of $\frac{1}{4}$?
 What is $\frac{1}{3}$ of $\frac{1}{5}$? $\frac{1}{2}$ of $\frac{1}{3}$? $\frac{1}{3}$ of $\frac{1}{3}$?
 What is $\frac{1}{4}$ of $\frac{1}{3}$? $\frac{1}{5}$ of $\frac{1}{3}$? $\frac{1}{3}$ of $\frac{1}{7}$?
 What is $\frac{1}{5}$ of $\frac{1}{3}$? $\frac{1}{2}$ of $\frac{1}{7}$? $\frac{1}{3}$ of $\frac{1}{7}$?
 What is $\frac{1}{4}$ of $\frac{1}{8}$? $\frac{1}{6}$ of $\frac{1}{8}$? $\frac{1}{7}$ of $\frac{1}{9}$?
 What is $\frac{1}{8}$ of $\frac{1}{12}$? $\frac{1}{8}$ of $\frac{1}{9}$? $\frac{1}{7}$ of $\frac{1}{10}$?
 What is $\frac{1}{9}$ of $\frac{1}{11}$? $\frac{1}{10}$ of $\frac{1}{11}$? $\frac{1}{11}$ of $\frac{1}{12}$?

What is $\frac{2}{3}$ of $\frac{3}{4}$?

SOLUTION.— $\frac{1}{3}$ of $\frac{3}{4}$ is $\frac{1}{4}$, and if $\frac{1}{3}$ of $\frac{3}{4}$ is $\frac{1}{4}$, $\frac{2}{3}$ of $\frac{3}{4}$ is 2 times $\frac{1}{4}$, which are $\frac{1}{2}$, and $\frac{2}{3}$ of $\frac{3}{4}$ are 2 times $\frac{1}{4}$, or $\frac{1}{2}$.

What is $\frac{1}{3}$ of $\frac{2}{3}$? $\frac{1}{4}$ of $\frac{2}{3}$? $\frac{1}{5}$ of $\frac{2}{3}$?
 What is $\frac{1}{4}$ of $\frac{5}{7}$? $\frac{1}{6}$ of $\frac{5}{8}$? $\frac{1}{7}$ of $\frac{5}{9}$?
 What is $\frac{1}{5}$ of $\frac{6}{7}$? $\frac{1}{8}$ of $\frac{7}{9}$? $\frac{1}{9}$ of $\frac{4}{12}$?
 What is $\frac{2}{3}$ of $\frac{5}{8}$? $\frac{3}{4}$ of $\frac{5}{9}$? $\frac{4}{5}$ of $\frac{6}{7}$?
 What is $\frac{3}{4}$ of $\frac{6}{7}$? $\frac{4}{5}$ of $\frac{7}{8}$? $\frac{5}{6}$ of $\frac{8}{9}$?

CONTRACTIONS

—IN—

FRACTIONS.

To square any number containing $\frac{1}{2}$, as $7\frac{1}{2}$, $8\frac{1}{2}$.

RULE.—Multiply the whole number by the next higher whole number, and annex $\frac{1}{4}$ to the product.

Ex. 1. What is the square of $7\frac{1}{2}$? Ans. $56\frac{1}{4}$.

We simply say, 7 times 8 are 56, to which we add $\frac{1}{4}$.

2. What will $9\frac{1}{2}$ lbs. beef cost at $9\frac{1}{2}$ cts. a lb.?
3. What will $12\frac{1}{2}$ yds. tape cost at $12\frac{1}{2}$ cts. a yd.?
4. What will $5\frac{1}{2}$ lbs. nails cost at $5\frac{1}{2}$ cts. a lb.?
5. What will $11\frac{1}{2}$ yds. tape cost at $11\frac{1}{2}$ cts. a yd.?
6. What will $19\frac{1}{2}$ bu. bran cost at $19\frac{1}{2}$ cts. a bu.?

REASON.—We multiply the whole number by the next higher whole number, because half of any number taken twice and added to its square is the same as to multiply the given number by ONE more than itself. The same principle will multiply any two *like* numbers together, when the sum of the fractions is ONE, as $8\frac{1}{8}$ by $8\frac{7}{8}$, or $11\frac{2}{3}$ by $11\frac{1}{3}$, etc. It is obvious

CONTRACTIONS IN FRACTIONS.

that to multiply any number by any two fractions whose sum is ONE, that the sum of the products *must be the original number*, and adding the number to its square is simply to multiply it by ONE more than itself; for instance, to multiply $7\frac{1}{4}$ by $7\frac{3}{4}$, we simply say, 7 times 8 are 56, and then, to complete the multiplication, we add, of course, the product of the fractions ($\frac{3}{4}$ times $\frac{1}{4}$ are $\frac{3}{16}$), making $56\frac{3}{16}$ the answer.

Multiplication,

WHERE THE SUM OF FRACTIONS IS ONE.

To multiply any two *like* numbers together when the sum of the fractions is ONE.

RULE.—Multiply the whole number by the next higher whole number; after which, add the product of the fractions.

Multiply $3\frac{1}{4}$ by $3\frac{1}{4}$ in a single line.

Multiply $\frac{1}{4} \times \frac{1}{4}$, which gives $\frac{1}{16}$, and set down $3\frac{3}{4}$
the result; then we multiply the 3 in the multi- $3\frac{1}{4}$
plicand, increased by unity, by the 3 in the —
multiplier, 3×4 , which gives 12 and completes $12\frac{3}{4}$
the product.

Multiply $7\frac{3}{8}$ by $7\frac{3}{8}$ in a single line.

Multiply $\frac{3}{8} \times \frac{3}{8}$, which gives $\frac{9}{64}$, and set down $7\frac{3}{8}$
the result; then we multiply the 7 in the multi- $7\frac{3}{8}$
plicand, increased by unity, by the 7 in the —
multiplier, 7×8 , which gives 56 and completes $56\frac{9}{64}$
the product.

Multiply $11\frac{1}{2}$ by $11\frac{1}{2}$ in a single line.

Multiply $\frac{1}{2} \times \frac{1}{2}$, which gives $\frac{1}{4}$, and set down $11\frac{1}{2}$
the result; then we multiply the 11 in the $11\frac{1}{2}$
multiplicand, increased by unity, by the 11 in —
the multiplier, 11×12 , which gives 132, and $132\frac{1}{4}$
completes the product.

CONTRACTIONS IN FRACTIONS.

To multiply any two numbers together, each of which involves the fraction $\frac{1}{2}$, as $7\frac{1}{2}$ by $9\frac{1}{2}$, etc.

RULE—To the product of the whole numbers add half their sum plus $\frac{1}{4}$.

1. What will $3\frac{1}{2}$ doz. eggs cost at $7\frac{1}{2}$ cts. a doz. ?
 Here the sum of 7 and 3 is 10, and half this $3\frac{1}{2}$
 sum is 5, so we simply say, 7 times 3 are 21 $7\frac{1}{2}$
 and 5 are 26, to which we add $\frac{1}{4}$. $26\frac{1}{4}$

N. B. If the sum be an odd number, call it one less to make it even, and in such cases the fraction must be $\frac{1}{2}$.

2. What will $11\frac{1}{2}$ lbs. cheese cost at $9\frac{1}{2}$ cts. a lb. ?

3. What will $8\frac{1}{2}$ yds. tape cost at $15\frac{1}{2}$ cts. a yd. ?

4. What will $7\frac{1}{2}$ lbs. rice cost at $13\frac{1}{2}$ cts. a lb. ?

5. What will $10\frac{1}{2}$ bu. coal cost at $12\frac{1}{2}$ cts. a bu. ?

REASON.—In explaining the above rule, we add half their sum, because half of either number added to half the other would be half their sum, and we add $\frac{1}{4}$, because $\frac{1}{2}$ by $\frac{1}{2}$ is $\frac{1}{4}$. The same principle will multiply any two numbers together, each of which has the same fraction ; for instance, if the fraction was $\frac{1}{3}$, we would add one-third their sum ; if $\frac{2}{3}$, we would add three-fourths their sum, etc. ; and then, to complete the multiplication, we would add, of course, the product of the fractions.

MULTIPLYING ANY TWO NUMBERS TOGETHER, EACH INVOLVING THE SAME FRACTION.

RULE.—To the product of the whole numbers, add the product of their sum by either fraction ; after which, add the product of their fractions.

1. What will $11\frac{3}{4}$ lbs. rice cost at $9\frac{3}{4}$ cts. a lb. ?

Here the sum of 9 and 11 is 20, and three- $11\frac{3}{4}$
 fourths of this sum is 15, so we simply say, 9 $9\frac{3}{4}$
 times 11 are 99 and 15 are 114, to which we ———
 add the product of the fractions ($\frac{9}{16}$). $114\frac{9}{16}$

CONTRACTIONS IN FRACTIONS.

2. What will $7\frac{3}{4}$ doz. eggs cost at $8\frac{3}{8}$ cts. a doz.?
3. What will $6\frac{3}{4}$ bu. coal cost at $6\frac{3}{4}$ cts. a bu.?
4. What will $45\frac{3}{4}$ bu. seed cost at $3\frac{3}{4}$ dols. a bu.?
5. What will $3\frac{3}{8}$ yds. cloth cost at $5\frac{3}{8}$ dols. a yd.?
6. What will $17\frac{3}{8}$ ft. boards cost at $13\frac{3}{8}$ cts. a ft.?
7. What will $18\frac{3}{4}$ lbs. butter cost at $18\frac{3}{4}$ cts. a lb.?

N. B. If the product of the sum by either fraction is a whole number with a fraction, it is better to reserve the fraction until we are through with the whole numbers, and then add it to the product of the fractions; for instance, to multiply $3\frac{1}{4}$ by $7\frac{1}{4}$, we find the sum of 7 and 3, which is 10, and one-fourth of this sum is $2\frac{1}{2}$; setting the $\frac{1}{2}$ down in some waste spot, we simply say, 7 times 3 are 21 and 2 are 23; then, adding the $\frac{1}{2}$ to the product of the fractions ($\frac{1}{8}$), gives $1\frac{3}{8}$, making $23\frac{3}{8}$, Ans.

MULTIPLYING ANY MIXED NUMBERS.

- RULE 1.**—Multiply the whole numbers together.
 2.—Multiply the upper digit by the lower fraction.
 3.—Multiply the lower digit by the upper fraction.
 4.—Multiply the fractions together.
 5.—Add these *four* products together.

EXAMPLE.—Multiply $12\frac{3}{8}$ by $9\frac{3}{4}$.

- | | |
|--|------------------|
| | $12\frac{3}{8}$ |
| | $9\frac{3}{4}$ |
| 1.—We multiply the whole numbers = | 108 |
| 2.—Multiply 12 by $\frac{3}{4}$ = | 9 |
| 3.—Multiply 9 by $\frac{3}{8}$ = | 6 |
| 4.—Multiply $\frac{3}{8}$ by $\frac{3}{8}$ = | $0\frac{9}{64}$ |
| 5.—Add these <i>four</i> products together, | $123\frac{9}{8}$ |

and we have the complete result.

N. B. When the student has become familiar with the above process it is better to do the intermediate work mentally, and, instead of writing out the partial products, add them in the mind as you pass along, and thus proceed very rapidly.

CONTRACTIONS IN FRACTIONS.

PRACTICAL BUSINESS METHOD

FOR MULTIPLYING ALL MIXED NUMBERS.

Business men generally, in multiplying the mixed numbers, only care about having the answer correct to the nearest cent; that is, they disregard the fraction. When it is a half cent or more, they call it another cent; if less than half a cent, they drop it. And the object of the following rule is to show the easiest and most rapid process of finding the product to the nearest unit of any two numbers, one or both of which involves a fraction.

Multiply $8\frac{1}{2}$ by $10\frac{1}{4}$.

Here we simply say 10 times 8 are 80 and $\frac{1}{4}$ of 8 is 2, making 82, and $\frac{1}{2}$ of 10 is 5, which makes 87; then $\frac{1}{4}$ times $\frac{1}{2}$ is $\frac{1}{8}$, making $87\frac{1}{8}$ the answer.

TO MULTIPLY ANY TWO NUMBERS TO THE NEAREST UNIT.

GENERAL RULE 1.—Multiply the whole number in the multiplicand by the fraction in the multiplier to the nearest unit.

2.—Multiply the whole number in the multiplier by the fraction in the multiplicand to the nearest unit.

3.—Multiply the whole numbers together and add the three products in your mind as you proceed.

N. B. In actual business the work can generally be done mentally; only easy fractions *occur in business*.

N. B. This rule is so simple and so true, according to all business usage, that every accountant should make himself perfectly familiar with its application. There being no such thing as a fraction to add in, there is scarcely any liability to error or mistake. By no other arithmetical process can the result be obtained by so few figures.

CONTRACTIONS IN FRACTIONS.

EXAMPLES FOR MENTAL OPERATION.

EXAMPLE FIRST.

Multiply $11\frac{1}{2}$ by $8\frac{1}{2}$ by business method. $11\frac{1}{2}$

Here $\frac{1}{2}$ of 11 to the nearest unit is 3, and $\frac{1}{2}$ $8\frac{1}{2}$
 of 8 to the nearest unit is 3, making 6, so we ———
 simply say, 8 times 11 are 88 and 6 are 94, Ans. 94

REASON.— $\frac{1}{2}$ of 11 is nearer 3 than 2, and $\frac{1}{2}$ of 8 is nearer 3 than 2. Make the nearest whole number the quotient.

EXAMPLE SECOND.

Multiply $7\frac{3}{4}$ by $9\frac{3}{4}$ by business method.

Here $\frac{3}{4}$ of 7 to the nearest unit is 3, and $\frac{3}{4}$ $7\frac{3}{4}$
 of 9 to the nearest unit is 7; then 3 plus 7 is $9\frac{3}{4}$
 10, so we simply say, 9 times 7 are 63 and 10 ———
 are 73, Ans. 73

EXAMPLE THIRD.

Multiply $23\frac{1}{2}$ by $19\frac{1}{2}$ by business method.

Here $\frac{1}{2}$ of 23 to the nearest unit is 6, and $\frac{1}{2}$ $23\frac{1}{2}$
 of 19 to the nearest unit is 6; then 6 plus 6 is $19\frac{1}{2}$
 12, so we simply say, 19 times 23 are 437 and ———
 12 are 449, Ans. 449

EXAMPLE FOURTH.

Multiply $128\frac{3}{4}$ by 25 by business method. $128\frac{3}{4}$

Here $\frac{3}{4}$ of 25 to the nearest unit is 17, so 25
 we simply say, 25 times 128 are 3200 and 17 ———
 are 3217, the answer. 3217

PRACTICAL EXAMPLES FOR BUSINESS MEN.

1. What is the cost of $17\frac{1}{2}$ lbs. sugar at $18\frac{3}{4}$ cts. per lb.?

CONTRACTIONS IN FRACTIONS.

Here $\frac{3}{4}$ of 17 to the nearest unit is 13, and $17\frac{1}{2}$
 $\frac{1}{2}$ of 18 is 9, 13 plus 9 is 22, so we simply $18\frac{3}{4}$
 say, 18 times 17 are 306 and 22 are 328, the $\frac{3}{4}$
 answer. $\$3.28$

2. What is the cost of 11 lbs. 5 oz. of butter at $33\frac{1}{3}$ cts. per lb.?

Here $\frac{1}{3}$ of 11 to the nearest unit is 4, and $11\frac{2}{3}$
 $\frac{2}{3}$ of 33 to the nearest unit is 10; then 4 $33\frac{1}{3}$
 plus 10 is 14, so we simply say, 33 times 11 $\frac{1}{3}$
 are 363 and 14 are 377, Ans. $\$3.77$

3. What is the cost of 17 doz. and 9 eggs at $12\frac{1}{2}$ cts. per doz.?

Here $\frac{1}{2}$ of 17 to the nearest unit is 9, and $17\frac{1}{2}$
 $\frac{1}{2}$ of 12 is 6; then nine plus 6 is 15, so we $12\frac{1}{2}$
 simply say, 12 times 17 are 204 and 15 are $\frac{1}{2}$
 222, the answer. $\$2.22$

4. What will be the cost of $15\frac{3}{4}$ yds. calico at $12\frac{1}{2}$ cts. per yd.?

Ans. $\$1.97$.

DECIMALS.

To reduce a decimal to a common fraction.

RULE.—Write the decimal as it stands, omitting the decimal point, for the numerator. For the denominator write 1 with as many ciphers annexed as there are decimal places in the numerator.

EXAMPLES.

Reduce .25 to an equivalent common fraction.

Ans. $\frac{25}{100}$, which reduced to its lowest terms $= \frac{1}{4}$.

Reduce .375 to a common fraction. Ans. $\frac{375}{1000} = \frac{3}{8}$.

Reduce .1875 to a common fraction. Ans. $\frac{3}{16}$.

Reduce .625 to a common fraction. Ans. $\frac{5}{8}$.

To reduce common fractions to decimals.

RULE.—Annex ciphers to the numerator, and divide by the denominator, prefixing a point to the quotient. There must be as many places in the quotient as there have been ciphers annexed; if not enough, prefix ciphers.

EXAMPLES.

Reduce $\frac{3}{4}$ to a decimal.

$$\begin{array}{r} 4 \overline{) 3.00} \\ \underline{0} \\ 0 \\ \underline{0} \\ 0 \end{array}$$

$$.75 = \frac{75}{100} \text{ Ans.}$$

Reduce $\frac{3}{8}$ to a decimal.

$$\text{Ans. .375.}$$

" $\frac{1}{7}$ " "

$$\text{Ans. .8571+}$$

" $\frac{1}{4}$ " "" $\frac{2}{3}$ " "

MULTIPLICATION OF DECIMALS.

RULE.—Multiply as in whole numbers, and from the right of the product point off as many figures for decimals as there are decimal places in both *multiplicand* and *multiplier*.

If there are not figures enough in the product, prefix ciphers.

EXAMPLES.

Multiply 4.25 by 6.5.

$$\begin{array}{r} 4.25 \\ 6.5 \\ \hline 2125 \\ 2550 \\ \hline 27625 \text{ Ans.} \end{array}$$

Multiply 84.5 by 4.

$$\begin{array}{r} 84.5 \\ 4 \\ \hline 338.0 \end{array}$$

Multiply 6.425 by 4.25.

$$\begin{array}{rcl} \text{" } 18.5 & \text{" } 6.75. \\ \text{" } 12.575 & \text{" } 9.375. \\ \text{" } .25 & \text{" } 6.0025. \\ \text{" } .275 & \text{" } 3.0025. \\ \text{" } 18.625 & \text{" } 5.25. \end{array}$$

What is the cost of $12\frac{3}{4}$ lbs. at $6\frac{1}{4}$ cts. per lb?What is the cost of $7\frac{1}{2}$ yds. at $18\frac{3}{4}$ cts. per yd?

NOTE.—It is sometimes more convenient to change common fractions to decimals before multiplying. $18\frac{3}{4} \times 12\frac{1}{4} = 18.75 \times 12.5$.

UNITED STATES MONEY.

10 Mills (m) = 1 cent, ct.

10 Cents = 1 dime, d.

10 Dimes = 1 dollar, \$.

10 Dollars = 1 eagle, E.

The origin of the symbol \$, or the United States dollar mark, has been ascribed to several sources. By some it is supposed to represent the *U* written upon the *S*, denoting U. S. (United States). Some think it is a modification of the figure 8, having reference to 8 reals, or piece of Eight, as the dollar was formerly called; others, that it represents the "Pillars of Hercules," which were stamped on the Pillar Dollar; and others, still, that it is a combination of the initials P. and S., from the Spanish *Peso Duro*, signifying Hard Dollar. As it is used in Portugal to note the thousands' place, it is probable that it originated in that country: a Mil-reis, or thousand reis, is written thus, 1\$000.

The term Dime is from the French *disme*, meaning ten.

The term Cent is from the Latin *centum*, a hundred.

The term Mill is from the Latin *mille*, a thousand.

UNITED STATES COINS.

The Gold Coins are the Double Eagle, \$20.00 ; Eagle, \$10.00 ; Half Eagle, \$5.00 ; Quarter Eagle, \$2.50 ; three dollar piece and dollar.

The Fifty Dollar Piece is not a legal coin. The Half Copper Cent is no longer coined. The Mill is not a coin. Gold coin contains nine parts gold and one part copper and silver.

The Silver Coins are Dollar, Half Dollar, Quarter Dollar, Dime, Half Dime and Three Cent Piece. Silver coins contain 9 parts silver and 1 part copper.

The Nickel Coins are the Cent the new Three Cent Piece and new Five Cent Piece.

The Nickel contains 88 parts copper and 12 parts nickel.

The Copper Coins are the Cent and Two Cent Pieces. The Two Cent and Cent Pieces are made of nickel and copper.

One Eagle (Gold) weighs 258 troy grains.

One Dollar (Silver) weighs 412.5 troy grains.

One Cent (Copper) weighs 168 troy grains.

23.2 grains of pure gold = \$1.00.

Gold Coins prior to 1834, like that of England — 88.8 per dwt. By an act of Congress of 1834 its value was made 94.8 cents per dwt. The old U.S. Eagle coined previous to 1834 is worth \$10.66.8.

By an act of Congress the payment of debt with coin is regulated as follows :

All Gold Coins at their respective value for any amount. The Half Dollar, Quarter Dollar, Dime and Half Dime at their respective value for debt under \$5.00. The Three Cent Piece for debts of any amount under thirty cents. The one cent pieces for debts of any amount under 10 cents.

STATE CURRENCY.

The money of this country before the adoption of the decimal currency by Congress in 1786 was in the denominations of pounds, shillings, and pence. The *Colonial notes* which were then in circulation had depreciated in value ; and the number of shillings equivalent to a dollar at that time are given in the following table :—

NEW ENGLAND CURRENCY.

New England States, Virginia,) \$1 = 6s. = 72d.
Kentucky, and Tennessee,) 1s. = 16½ cts.

NEW YORK CURRENCY.

New York, Ohio, Michigan, } **\$1 = 8s. = 96d.**
and North Carolina, } **1s. = 12½ cts.**

PENNSYLVANIA CURRENCY.

Pennsylvania, New Jersey, Del- } \$1 = 7s. 6d. = 90d.
aware, and Maryland, } 1s. = 13½ cts.

GEORGIA CURRENCY.

Georgia and South Carolina, $\$1 = 4s. 8d. = 56d.$
 $1s. = 21\frac{3}{4}$ cts.

The Coins of Foreign Nations,

*With their value in United States coins, as determined
by the recognized standard at the Mint
in Philadelphia.*

GOLD COINS.

COUNTRY.	DENOMINATION.	Value in U. S. money		
		\$	cts.	in.
Austria	Fourfold ducat	9	13	1
"	4 florins (new)	1	93	5
"	Ducat	2	27	9
Belgium	25 francs	4	72	0
Brazil	29 milreis	10	89	3
Central America	2 escudos	3	68	7
"	4 reals	0	48	7
Chili	10 pesos (dollar)	9	11	4
Columbia and South America generally..	Old doubloon	15	59	2
Columbia	20 pesos, "Bogota"	18	94	6
"	20 pesos, "Medellin"	19	05	5
"	20 pesos, "Popayan"	18	96	2
Costa Rica	10 pesos	8	44	7
Denmark	20 crown	5	35	8
"	Old ten thaler	7	89	8
Egypt	Bedidlik (100 piasters)	4	97	3
England	Pound, or sovereign (new)	4	86	5
France	20 francs	3	84	5
German Empire	New 20 marks	4	76	3
Greece	20 drachms	3	44	2
India (British)	Mohur, or 15 rupees	7	10	3
Italy	20 lire	3	84	5
Japan	20 yen	19	94	2
Mexico	Doubloon	15	60	0
Netherlands	10 gilders	3	99	3
New Grenada	10 pesos (dollars)	9	67	4
Norway	20 crowns	5	35	8
Peru	20 soles	19	23	7
Portugal	Coroa (crown)	5	80	5
Russia	5 rubles	3	97	5
Spain	100 reals	4	96	3
"	80 reals	3	86	2
Sweden	Ducat	2	23	6
"	Carolus (10 francs)	1	93	4
Tunis	25 piasters	2	99	5
Turkey	100 piasters	4	36	8

SILVER COINS.

COUNTRY.	DENOMINATION.	Value in U. S. money		
		\$	cts.	m.
Austria	Old rix-dollar	0	95	4
“	New florin	0	45	3
“	New Union dollar	0	63	1
Belgium	5 francs	0	91	5
Bolivia	New dollar	0	91	5
Brazil	Double milreis	0	95	4
Canada	20 cents	0	17	6
Central America	Dollar	0	93	5
Chili	Old dollar	0	99	6
“	New dollar	0	91	6
China	Dollar (English mint)	0	99	1
“	10 cents	0	09	9
Denmark	2 rigsdaler	1	03	2
Egypt	Piaster (new)	0	03	8
England	Shilling (new)	0	21	4
“	Shilling (average)	0	20	9
“	Florin	0	42	9
France	5 francs	0	91	6
North German States	Thaler, before 1857	0	67	8
“ “ “	Thaler (new)	0	68	0
South German States	Florin	0	88	9
German Empire	5 marks (new)	0	91	9
Greece	5 drachms	0	82	2
Hindustan	Rupee	0	43	4
Italy	5 lire	0	91	7
Japan	1 yen	0	99	1
“	50 sen	0	40	8
Mexico	Dollar	0	99	8
Netherlands	2½ gilders	0	96	4
Norway	Specie daler	1	93	2
New Grenada	Dollar of 1857	0	91	1
Peru	Old dollar	0	99	0
Portugal	500 reis	0	46	3
Roumania	2 lei (francs), new	0	84	1
Russia	Ruble	0	74	1
Spain	5 pesetas (dollars)	0	91	4
Sweden	Riksdaler	0	26	0
Switzerland	2 francs	0	33	9
Tunis	5 piasters	0	58	3
Turkey	20 piasters	0	81	1

GREAT BRITAIN'S MONEY.

4 Farthings = 1 Penny, *d.*

12 pence = 1 Shilling, *s.*

20 shillings = 1 Pound, *£.*

The *Gold coins* are the sovereign, which represents the pound, and the half-sovereign. The guinea, of 21 shillings, and its subdivisions, have not been coined since 1816.

The *Silver coins* are crowns of 5*s.*, half-crowns, florins of 2*s.*, shillings, the 6*d.*, the 4*d.* or groats, and 3*d.* pieces.

The *Copper coins* are the penny, half-penny, and farthing, coined at the rate of 24 pence per pound avoirdupois

Bank of England Notes are a legal tender for any sum over *£*5 ; silver is not a legal tender over 40*s.* ; copper, for not more than 12*d.* in pennies or half-pennies ; or 6*d.*, in farthings.

£ is a contraction of *librae*, *s.* of *solidi*, *d.* of *denarii*, and *q.* of *quadrantes* ; farthing is another word for *fourthing*.

The word sterling is supposed to be derived from the first coiners of English silver, who came into England from Germany in the reign of Richard I., and were called *Easterlings*. It is used to distinguish the currency of Great Britain from that of the Colonies, and from some continental money bearing the same denominations.

Valuable Information for Business Men.

NOTES.

Demand Notes are payable on presentation, without grace, and bear legal interest after a demand has been made, if not so written. An endorser on a demand note is holden only for a limited time, variable in different States.

A *Negotiable Note* must be made payable either to bearer, or be properly endorsed by the person to whose order it is made. If the endorser wishes to avoid responsibility, he can endorse "without recourse."

A *Joint Note* is one signed by two or more persons, who can each become liable for the whole amount.

Three Days' Grace are allowed on all time notes, after the time for payment expires ; if not then paid, the endorser, if any, should be legally notified to be holden.

Notes Falling Due Sunday, or on a legal holiday, must be paid the day previous.

Notes Dated Sunday are void.

Altering a Note in any manner, by the holder, makes it void.

Notes Given by Minors are void.

The Maker of a Note that is lost or stolen is not released from payment if the amount and consideration can be proven.

Notes Obtained by Fraud, or given by intoxicated persons, cannot be collected.

An *Endorser* has a right of action against all whose names were previously on a note endorsed by him.

BILLS OF EXCHANGE, DRAFTS, ACCEPTANCES.

A Bill of Exchange, or Draft is an order drawn by one person, or firm, upon another, payable either at sight or at a stated future time.

It becomes an "Acceptance" when the party upon whom it is drawn writes across the face "Accepted," and signs his name thereto; and is negotiable and bankable the same as a note, and is subject to the same laws.

In many States both Sight and Time Drafts are entitled to three days' grace, the same as notes; but if made in form of bank check, "pay to," without the words "at sight," it is payable on presentation, without grace.

HOW TO ENDORSE A CHECK.

Very few otherwise intelligent and educated people understand how to properly endorse a Bank check payable to their order, and few realize the inconvenience they cause, by placing their endorsement in an awkward position. An observance of the following rules will enable anyone to place their signature in the proper place.

1. Write *across* the back—not lengthwise.
2. The top of the *back* is the *left* end of the *face*.
3. To deposit a check, write "For Deposit," and below this your name. A clerk not having power of attorney to sign or indorse checks, can deposit his firm's checks by writing on the top of the back "For deposit only to credit of [FIRM'S NAME]" and below this write his own name.

4. Simply writing your name on the back of a check signifies that it has passed through your hands, and is payable to bearer.

5. Always indorse a check just as it appears on the face. For instance, if the check is payable to "G. Read," indorse "G. Read ;" if to "Geo. Read," indorse "Geo. Read ;" if to "George F. Read," indorse "George F. Read." If the spelling of the name on the face of the check is wrong, indorse first just as the face appears, and below, the proper way. For instance, the check is payable on face to "George Reade ;" indorse "George Reade," and below this first indorsement write what it should have been, "George Read."

6. If you wish to make the check payable to some particular person, write, "Pay to [PERSON'S NAME] or order." [YOUR NAME.]

NOTE. In England all checks are payable to bearer; but in this country all strangers presenting checks for payment must be identified by some one known to the bank.

CALCULATIONS

USED IN PARTICULAR BRANCHES OF BUSINESS.

To find the value of tons and hundred-weight without the use of fractions?

RULE.—Multiply the number of hundred-weight by 5, and annex the product to the tons, as so many hundredths of tons; then multiply by the given price per ton, and point off two decimals.

EXAMPLES.

1. What is the cost of 18 tons, 17 cwt. coal at \$4 per ton?

$$17 \times 5 = 85 \quad 18.85 \times 4 = 75.40. \quad \text{Ans. } \$75.40.$$

2. What is the cost of 35 tons, 15 cwt. hay at \$12 per ton?

3. What is the cost of 48 tons, 17 cwt. coal at \$6.50 per ton?

To find the value of shillings and pence in the decimals of a pound sterling.

RULE.—Multiply the shillings by 5, and call the product hundredths.

Multiply the pence by $4\frac{1}{2}$, and call the product thousandths.

The sum of these two values will be the decimal required.

EXAMPLES.

1. Reduce 12s. 6d. to the decimal of a pound.

$$\begin{array}{r} 12 \times 5 = .60 \\ 6 \times 4\frac{1}{2} = .025 \\ \hline .625 \end{array}$$

SPECIAL CONTRACTIONS.

2. Reduce £187 13s. 3d. to the decimal of a pound.

$$13 \times 5 = .65$$

$$3 \times 4\frac{1}{2} = .0125$$

$$\begin{array}{r} .6625 \\ \hline \end{array} \text{ Ans. } £187.6625.$$

To change aunes to yards.

NOTE.—An aune is a French measure, equal to $1\frac{1}{4}$ yards.

RULE.—Annex a cipher and divide by 8.

EXAMPLES.

1. In 484 aunes, how many yards?

$$4840 \div 8 = 605 \quad \text{Ans.}$$

2. In 3848 aunes, how many yards? In 1265? In 1847?

NOTE.— $1\frac{1}{4} = \frac{4}{3}$, or $\frac{10}{8}$. This rule can easily be applied to numerous other calculations. The contents of boards $1\frac{1}{4}$ inches thick, etc., may be computed in this manner; the selling price of goods in order to gain 25 per cent on the cost, and others.

3. What is the selling price of goods, which cost 64 cents per yard, to gain 25 per cent?

$$640 \div 8 = 80$$

$$64$$

$$\begin{array}{r} 16 \\ \hline 80 \end{array} = 25\% \text{ of } 64.$$

To find how many gallons of linseed oil in a given number of pounds, at $7\frac{1}{2}$ lbs. per gallon.

RULE.—Add one-third of the number of pounds to itself, and point off one decimal.

EXAMPLES.

1. How many gallons in 675 lbs.?

$$675$$

$$225 = \frac{1}{3} \text{ of } 675$$

$$\begin{array}{r} 90.0 \\ \hline \end{array}$$

$$\text{Ans. } 90 \text{ gals.}$$

2. In 1846 lbs. how many gallons? In 675? In 338 lbs.?

Another Method

To reduce pounds, shillings and pence to the decimal of a pound.

Rule. -- Write one-half of the greatest even number of shillings as tenths, and if there be an odd shilling write five hundredths; reduce the pence and farthings to farthings, and write their number as thousandths. If the number of farthings is between 12 and 36, add one to the thousandths; if between 36 and 48, add 2 to the thousandths.

EXAMPLE: —

$$£3\ 14s.\ 6 = £3.725.$$

Put down the £3, then divide the 14 by 2 and put down 7, then multiply 6 by 4 and add 1 to get the 25. Again,

$$£4\ 15s.\ 10d. = £4 - 7\frac{1}{2}2 = £4.792.$$

In this example one-half of 15 is $7\frac{1}{2}$; therefore we put it down in the decimal form .75, and 4 times 10 are 40, add 2 and we have 42, which added to .75 gives .792.

EXERCISES.

- | | | |
|----------------|-----------------|------------------------------|
| 1. £2 3s. 6d. | 6. £3 3s. 2d. | 11. £5 12s. 11d. |
| 2. £4 6s. 5d. | 7. £2 5s. 3d. | 12. £9 15s. 10d. |
| 3. £8 10s. 3d. | 8. £4 7s. 4d. | 13. £8 17s. 9d. |
| 4. £9 4s. 5d. | 9. £6 9s. 5d. | 14. £6 18s. 8d. |
| 5. £10 2s. 3d. | 10. £1 11s. 6d. | 15. £5 16s. $7\frac{1}{2}d.$ |

To reduce pounds to dollars.

Rule. -- Multiply the number of pounds by \$4.84.

EXAMPLE: —

Reduce £3.725 to dollars and cents.

$$3.725 \times 4.84 = 18.029.$$

INTEREST.

Interest is the money which is paid for the use of money.

The **Principal** is the sum for the use of which interest is paid.

The **Rate** is the per cent. of the principal paid for any given time.

NOTE. — When no time is mentioned, *per annum*, or *by the year*, is understood.

The **Amount** is the sum of the principal and interest.

Simple Interest is the interest on the sum loaned for the given time, at the given rate.

Legal Interest is the interest according to a certain rate per annum, fixed by law.

NOTE 1. — A higher rate of interest than that prescribed by law is termed *usury*, and is prohibited by law.

NOTE 2. — When the rate per cent. is not named in notes, or other business documents, the *legal rate* must be taken.

NOTE 3. — In most of the States, and on debts due in the United States, 6 per cent. is the legal rate, although a higher rate may be agreed upon by special contract.

When no rate is mentioned, the legal rate is understood. Interest may be simple or compound. In simple interest the principal alone draws interest. Interest on interest remaining unpaid is considered illegal. In compound interest the entire amount due at regular intervals is converted into a new principal. It is compounded annually, semi-annually or quarterly, and sometimes monthly, according to agreement.

To be an expert in computing interest it is necessary to be familiar with all the methods, and apply the one that will give the correct result with the least labor. To compute interest for years, multiply the principal by the per cent., and you have the interest for one year.

EXAMPLE 1 — What is the interest on \$84 at 6 per cent. for 3 years?

$$\$84 \times .06 = \$5.04 \times 3 = \$15.12.$$

INTEREST.

IF THE TIME CONSISTS OF MONTHS.

Multiply the principal by the per cent, and you have the interest for 1 year. 1 month being $\frac{1}{12}$ of a year, divide by 12 for the interest of 1 month; multiply this result by the number of months for the interest.

EXAMPLE 2.—What is the interest on \$120, at 8 per cent for 8 months?

COMMON METHOD.

$$\begin{array}{r}
 120 \\
 .08 \\
 \hline
 12 \overline{) 9.60} \\
 \underline{.80} \\
 8 \\
 \underline{ 6.40}
 \end{array}$$

CANCELLATION.

$$\begin{array}{r}
 10 \\
 12 \overline{) 120} \\
 8 \times 8 \times 10 = 6.40 \\
 8
 \end{array}$$

NOTE.—If the time consists of years and months, reduce the years to months, adding the number of months, and proceed as above.

IF THE TIME CONSISTS OF YEARS, MONTHS AND DAYS.

Reduce years to months, adding the number of months, then place $\frac{1}{3}$ of the number of days to the right of the months and proceed as before.

REMARK.—Placing $\frac{1}{3}$ of the days to the right, is reducing the days to the decimal of a month. The reason of this is obvious from the fact that we calculate 30 days for 1 month, then 1 day is $\frac{1}{30}$ of a month, and 3 days $\frac{3}{30}$, or $\frac{1}{10}$, or in decimal form .1; hence by taking $\frac{1}{3}$ of the number of days we obtain tenths of a month.

EXAMPLE 3.—What is the interest on \$150, at 9 per cent, for 1 year, 4 months. and 12 days:

INTEREST.

COMMON METHOD.

$ \begin{array}{r} 150 \\ .09 \\ 12 \overline{) 13.50} \\ \underline{1.125} \\ 16.4 \\ \underline{} \\ 18.4500 \end{array} $	$ \begin{array}{l} 1 \text{ year} = 12 \text{ months.} \\ \phantom{1 \text{ year}} 4 \text{ " } \\ 12 \text{ days} = .4 \text{ " } \\ \hline 16.4 \text{ months} \end{array} $
---	--

BY CANCELLATION.

$\frac{4}{12}$	$ \begin{array}{r} 150 \\ 9 3 \\ 18.4 41 \end{array} $	$ \begin{array}{l} 3 \times 15 = 45 \times 41 = 18.45 \\ 41 \times 3 \times 15 = 18.45 \end{array} $
----------------	---	---

This operation comes under the head of contractions, and can be multiplied mentally.

ON ALL NOTES THAT BEAR \$12 PER ANNUM, OR ANY ALIQUOT PART OR MULTIPLE OF 12.

Any principal that bears \$12 per year will bring \$1 per month; hence, the time in months must be the interest.

ILLUSTRATION.—If the interest for 1 month is \$1, for 15.3 months it is 15.3 times \$1, or \$15.30; since the multiplication by the figure 1 is altogether superfluous we can dispense with it, and at once say \$15.3 or \$15.30. Hence the propriety of the following:

RULE.—Reduce years to months, add in the given months, place $\frac{1}{2}$ the number of days to the right, and we have the interest in dimes.

EXAMPLE 1.—Required the interest for \$150, at 8 per cent, for 1 year, 6 months, and 11 days.

$ \begin{array}{r} 150 \\ .08 \\ 12.00 \overline{) } \end{array} $	$ \begin{array}{l} \frac{1}{2} \text{ of 11 days} = 3\frac{1}{2} \\ \text{Years. Months. Days.} \\ 1 \quad 6 \quad 11 = 18.3\frac{1}{2} \end{array} $
---	---

therefore \$18.3 $\frac{1}{2}$ dimes, or \$18.36. Ans.

INTEREST.

A note that bears an aliquot part or multiple of 12; such as 6, 18, 24, 36, etc.

EXAMPLE 2.—What is the interest on \$300, at 6 per cent, for 3 years, 6 months, and 18 days?

\$300	1/3 of 18 days = 6.
<u>.06</u>	
18.00	Years. Months. Days.
	3 6 18 = 42.6.
\$42.60 Interest at \$12 a year.	
<u>21.30</u>	“ “ \$6, or 1/2 of \$12, a year.
63.90	

CANCELLATION.

2	300	
12	42.6	213 × 300 = 63.90
	6	

NOTE.—To find the time any sum will double itself at simple interest, simply divide 100 by the rate per cent.

ANOTHER METHOD TO COMPUTE INTEREST FOR DAYS.

RULE.—Find the interest for 1 year and divide by 360 (the number of interest days in a year), and multiply by the number of days for the interest.

EXAMPLE.—Required the interest on \$720, for 60 days, at 8 per cent.

\$720		
<u>.08</u>		
360) 57.60 (.16		
<u>360</u>	60	
2160	9.60	
2160		

360

720 2

60

8 × 60 × 2 = 9.60

REMARK.—In using 360 for a divisor the cipher may be rejected, because it avails nothing in dividing, and makes the divisor ten times as short; your answer will be mills instead of cents, as before; cut off the *right hand figure*, and you have the interest in cents.

INTEREST.

For 10 per cent add $\frac{2}{3}$.

" 12 " multiply by 2.

EXAMPLE.—What is the interest of \$124, at 7 per cent, for 54 days?

$\frac{1}{8}$ of 54 = 9.

$$\begin{array}{r} 124 \\ 9 \\ \hline 1.116 \\ .186 = \frac{1}{5} \\ \hline \$1.302 \end{array}$$

$$\begin{array}{r|l} 4 & 81 \\ 33 & 124 \\ & 31 \quad 6 \\ & 7 \times 6 \times 31 = 1.302. \end{array}$$

Bankers' Method.

Banking business being nearly all transacted on the basis of 30, 60, and 90 days, the work can be very much abbreviated and the interest, sometimes, obtained without any calculation whatever.

The following example will best illustrate this rule.

EXAMPLE.—What is the interest on \$120, for 60 days, at 6 per cent?

$$\begin{array}{r|l} 6 & 120 \\ 33 & 60 \\ & 6 \end{array} \quad 10 \times 120 = 1.200 \quad \text{Ans.}$$

Observe that in this case we cancel the factors in the time and rate, and that the figures in the principal remain unchanged, therefore:

RULE. — For any note at 6 per cent for 60 days remove the decimal point two places to the left, and you have the interest.

EXAMPLE.—Required the interest on \$350, at 6 per cent, for 60 days.

SOLUTION.—Remove the point in the \$350 two places to the left, thus: 3.50, and you have the result.

INTEREST.

This is the shortest and best rule for days that can be adopted, because it may be applied in any per cent and any number of days. The great superiority of this rule consists in its simplicity, and when once understood is not readily forgotten.

Some accountants have a different rule for every per cent, many of which are not only apt to be forgotten, except by those who apply them daily, but are actually deduced from the above rule.

In reckoning 360 days instead of 365 gives $\frac{1}{365}$, or $\frac{1}{73}$, too much. But the difference is so small that in ordinary transactions it is not noticed. It is now universally adopted in all business transactions.

To find the accurate interest divide by 365 instead of 360.

When the time is less than 1 month, the cents in the principal may be disregarded, because the interest on *that* sum for *that* time would not amount to a cent; when less than 2 months, all under 50 cents, when less than 3 months, all under 33, and so on.

To illustrate we will give the table of divisors for the different per cents. Any sum multiplied by the time in days, and divided by the number opposite the per cent, will give the interest at that per cent.

At 5 % divide by 72	At 12 % divide by 30
" 6 % " " 60	" 15 % " " 24
" 7 % " " 52	" 20 % " " 18
" 8 % " " 45	" 24 % " " 15
" 9 % " " 40	" 40 % " " 09
" 10 % " " 36	

It will be observed that these divisors are obtained by dividing 360 by the rate per cent; and the student will have to retain in his memory a different divisor for every per cent when, by using 36, once for always

INTEREST.

he need remember but one. The great advantage of using 36 must at once be admitted. Some authors use 12 and 30 which, of course, is the same thing; we will now give a few solutions of problems as solved by the old method, and also by cancellation, that the student may perfectly understand them.

EXAMPLE 1.—What is the interest of \$80 for 1 year, 5 months, and 12 days?

$$\begin{array}{r}
 80 \\
 .06 \\
 \hline
 480 \\
 522 \\
 \hline
 960 \\
 960 \\
 2400 \\
 \hline
 360 \overline{) 250560} \quad \$6.96 \\
 \underline{2160} \\
 3456 \\
 \underline{3240} \\
 2160 \\
 \underline{2160} \\
 0
 \end{array}
 \qquad
 \begin{array}{r}
 1 \text{ yr., } 5 \text{ mo., } 12 \text{ days} = 522 \text{ days.} \\
 \\
 \begin{array}{r|l}
 80 & \\
 \cancel{36} & \cancel{6} \\
 \cancel{6} & \cancel{522} \\
 \hline
 87 \times 80 = 6.960.
 \end{array}
 \end{array}$$

The student will here notice the vast amount of labor saved in the cancelling method.

EXAMPLE 2.—What is the interest on \$48 for 2 years, 3 months, and 6 days, at 8 per cent?

2 years, 3 months, 6 days = 816 days.

$$\begin{array}{r|l}
 8 & 48 \quad 8 \\
 \cancel{36} & 8 \\
 \hline
 \cancel{316} & 136 \times 8 \times 8 = 8.704
 \end{array}$$

Another short rule for computing interest is called

THE SIX PER CENT BASIS.

TO FIND THE INTEREST FOR MONTHS AT 6 PER CENT.

RULE.—Multiply the principal by one half the number of months; when the principal is dollars only, point off two

INTEREST.

places for cents in the product; when dollars and cent point off four places.

EXAMPLE 1.—What is the interest on \$153, at 6 per cent, for eight months?

$$\frac{1}{2} \text{ of } 8 = 4$$

$$\begin{array}{r} 153 \\ 4 \\ \hline \$6.12 \text{ Ans.} \end{array}$$

$$\begin{array}{r|l} 2 & 153 \times 4 = \$6.12 \text{ Ans.} \\ 12 & 8 \\ & 8 \ 4 \end{array}$$

Solving the above by cancellation will show why half the number of months, at 6 per cent, will bring the interest.

TO FIND THE INTEREST FOR DAYS AT 6 PER CENT.

RULE.—Multiply by $\frac{1}{6}$ of the number of days, and the product will be the interest in mills.

EXAMPLE.—What is the interest on \$124, at 6 per cent, for 54 days?

$$\frac{1}{6} \text{ of } 54 = 9.$$

$$\begin{array}{r} 124 \\ 9 \\ \hline \$1.116. \text{ Ans.} \end{array}$$

$$\begin{array}{r|l} 6 & 124 \times 9 = 1.116. \\ 36 & 54 \ 9 \\ & 6 \end{array}$$

It will be observed, also, in this that it is an abbreviation of cancellation.

TO FIND THE INTEREST AT ANY GIVEN RATE.

RULE.—Find the interest at 6 per cent as above; divide by 6 for 1 per cent, then multiply by the given rate; or, increase or diminish the result obtained by the rule for 6 per cent, in the same ratio that the rate is increased or diminished.

For 4 per cent subtract $\frac{1}{3}$.

" 5 " " $\frac{1}{6}$.

" 7 " " add $\frac{1}{6}$.

" 8 " " $\frac{1}{3}$.

" 9 " " 0.

INTEREST.

When the Time is more or less than 60 Days.

Increase or diminish in the same ratio as the time is increased or diminished.

For 90 days	add $\frac{1}{2}$	itself.
" 120 "	multiply	by 2.
" 30 "	divide	by 2.
" 15 "	"	4.
" 45 "	subtract	$\frac{1}{4}$.
" 20 "	divide	by 3.
" 10 "	"	6.
" 6 "	"	10.
" 3 "	"	20.

NOTE.—Nearly all business paper is calculated on 30, 60, 90 days, or an aliquot part or multiple of a month.

EXAMPLE 1 —What is the interest on \$120. for 90 days, at 6 per cent?

\$1.20 interest for 60 days.
.60 " " $\frac{1}{2}$ of 60 or 30 days.
 \$1.80 interest for 90 days.

EXAMPLE 2.—What is the interest on \$134.24, for 75 days, at 6 per cent?

\$1.3424 interest for 60 days.
.3356 " " 15 " or $\frac{1}{4}$ of 60 days.
 \$1.6780

The interest at any other rate can be obtained as in preceding rule, or by the following, which will show in what time, at the different rates, any number of dollars will give the interest in cents corresponding with the same figures in the principal. Thus the interest on \$140 for 90 days, at 4 per cent, is \$1.40.

This rule is no shorter than the other, unless the time corresponds with the same figures in the table, or when it is an aliquot part of the time in the table.

INTEREST

RULE.—When the time and rate correspond with the time and rate in the table, remove the decimal point two places to the left, as in the preceding rule.

4 per cent for 90	8 per cent for 45
5 " " 72	9 " " 40
6 " " 60	10 " " 36
7 " " 52	12 " " 30

The cancelling system is very much preferred to this, because it very frequently takes advantage of both time and principal, as will be seen in the following solution :

EXAMPLE. —Required the interest on \$540, for 49 days, at 6 per cent?

BANKER'S METHOD.

$$\begin{array}{rcl}
 \$5.40 & = & \text{Interest for 60 days.} \\
 2 \overline{) 5.40} & & \\
 2 \overline{) 2.70} & = & \text{Interest for 30 days.} \\
 5 \overline{) 1.35} & = & \text{" " 15 " } \\
 3 \overline{) .27} & = & \text{" " 3 " } \\
 .09 & = & \text{" " 1 day.} \\
 \hline
 \$4.41 & &
 \end{array}$$

CANCELLATION.

$$\begin{array}{r|l}
 \$ & 540 \cdot 90 \\
 60 & 49 \times 90 = 4410 \\
 & \$
 \end{array}$$

N. B.—Where the time is not an aliquot part of the time in the table, but the principal is, reverse the operation and point off two places in your time for the interest, thus: a note that bears \$1.17 in 60 days, at 6 per cent, on \$117, is the same as \$60 for 117 days.

NOTE.—We have now conclusively proven that *all* the abbreviated processes of computing interest are based entirely upon the system of cancellation.

INTEREST.

Indeed, there are many other methods that might abbreviate the work, *if you have examples to suit*.

But the canceling system will give you the advantage at $4\frac{1}{2}$, 6, 8, 9, 12, and 15 per cents, and very frequently of the time and principal. And, to say the least, if the numbers are *all* prime, and you can cancel *none*, you have stated your problem in its simplest form to be solved by any other rule. We therefore recommend without hesitation the adoption of the system of Cancellation, as a *general* and *universal* rule. The student, by close observation and considerable practice, may deduce rules from *this*.

How to find the PRINCIPAL, the rate, time and interest being given.

RULE.—Divide the given interest by the interest on one dollar for your time and rate.

To find the RATE, when principal, time and interest are given.

RULE.—Divide the given interest by the interest on the principal at one per cent.

To find the TIME, principal, rate and interest being given.

RULE.—Divide the given interest by the interest on the principal for one day, the quotient will be the required time in days.

How to Compute Time.

RULE.—Subtract as in compound numbers, reckoning 30 days to the month.

EXAMPLE.—What is the time from January 30th, 1869, to March 13th, 1870?

INTEREST.

1870	3	13
1869	1	30
<hr/>		
1	1	13
Year.	Month.	Days.

SUGGESTION.—When you are obliged to borrow from the next higher number, in subtraction of compound numbers, subtract the number in the subtrahend from the borrowed number first, then add the number to the minuend, thus, as in above,

$$30 \text{ from } 30 = 0 + 13 = 13.$$

Partial Payments.

The manner of computing interest where partial payments have been made, has given rise to much litigation. The law in the different states on the subject very often does not clearly indicate the principle applicable in all cases. The aim of the law, of course, is to avoid usury and compound interest. The difficulty is in deciding whether the payment shall be applied to liquidate the interest or the principal. The U. S. rule involves compound interest, as often as a payment is made greater than the interest then due. When more than a year intervenes, the U. S. rule is more favorable.

The Vermont rule is more favorable, for there is no compound interest. All payments draw interest.

We give an illustration of a problem under these rules, and the pupil can see the difference readily.

The United States Rule.

I.—The rule for casting interest when partial payments have been made, is to apply the payment, in the first place, to the discharge of the interest then due.

INTEREST.

II.—If the payment exceeds the interest, the surplus goes towards discharging the principal, and the subsequent interest is to be computed on the balance of the principal remaining due.

III.—If the payment be less than the interest, the surplus of the interest must not be taken to augment the principal; but the interest continues on the former principal until the period when the payments exceed the interest due, and *then* the surplus is to be applied towards discharging the principal, and the interest is to be computed on the balance, as afore-said.—The above is the decision of Chancellor Kent; Johnson's Chancery Reports, Vol. 1, Page 17, and is adopted by the Supreme Court of the United States.

EXAMPLE 1.

PHILADELPHIA, May 1, 1842.

For value received, I promise to pay to the order of J. THORNTON the sum of Three Hundred Dollars, with interest. THOS. CLARK.

The following endorsements were made on this note:

1842, Oct. 16.	- - -	\$ 60.00
1843, March 4,	- - -	17.50
1843, Aug. 27,	- - -	28.40
1844, April 1,	- - -	132.25.

What was the balance due Sept. 19, 1844?

Amount of the Note.....	\$300.00
Interest to Oct. 16, 1842	8.25
First Amount	\$308.25
First Payment.....	60.00
New Principal.....	\$248.25
Interest from Oct. 16, 1842 to Mch. 21, 1843	6 41
Second Amount	\$254.66

INTEREST.

Second Amount	\$254.66
Second Payment.....	17.50
New Principal.....	<u>\$237.16</u>
Interest from Mch. 21, 1843, to Aug. 27, 1843	6.17
Third Amount.....	<u>\$243.33</u>
Third Payment	28.40
New Principal.....	<u>\$214.93</u>
Interest from Aug. 27, 1843, to Apr. 1, 1844	7.66
New Principal	<u>\$222.59</u>
Fourth Payment	132.25
New Principal.....	<u>\$ 90.34</u>
Interest from Apr. 1, 1844, to Sept. 19, 1844	2.52
Balance due Sept. 19, 1844.....	<u>\$ 92.86</u>

The following is called

The Vermont Rule,

And is generally applied when the time is less than a year.

I.—Compute the interest on the whole debt from the time it was due until it is paid.

II.—Compute the interest on all payments, from the time of payment until the time of settlement.

III.—Subtract the amount of all the payments, interest included, from the amount of debt, interest included; the balance will be the amount due.

EXAMPLE 2.

One year after date I promise to pay, to the order of D. B. JONES, the sum of Three Hundred and Sixty Dollars, for value received *with use*.

SHELBY, O., Jan. 1, 1869.

JOHN MILES.

N. B.—When no rate is mentioned, 6 per cent. is understood.

Interest Laws in the United States.

COMPILED FROM THE LATEST STATE AND TERRITORIAL STATUTES.

Laws of each State and Territory regarding rates of interest and penalties for usury, with the law or custom as to days of grace on notes or drafts.

States and Territories.	Legal Rate of Interest, per cent.	Rate Allowed by Contract, per cent.	Penalties for Usury.	Grace or No Grace.
Alabama.....	8	8	Forfeiture of entire interest.	Grace.
Arizona.....	10	Any rate.	None.	Grace.
Arkansas.....	6	10	Forfeiture of principal and interest.	No Statute.
California.....	7	Any rate.	None.	No Grace.
Colorado.....	10	Any rate.	None.	Grace.
Connecticut.....	6	6	None.	Grace.
Dakota.....	7	12	Forfeiture of excess.	Grace.
Delaware.....	6	6	Forfeiture of principal.	Grace.
District of Columbia.....	6	10	Forfeiture of entire interest.	Grace.
Florida.....	8	Any rate.	None.	No Statute.
Georgia.....	7	8	Forfeiture of excess.	Grace.
Idaho.....	10	18	Forfeiture of three times excess of interest.	No Grace.
Illinois.....	6	8	Forfeiture of entire interest.	Grace.
Indiana.....	6	8	Forfeiture of excess of interest.	Grace.
Iowa.....	6	10	Forfeiture of 10 per cent per year on amount.	Grace.
Kansas.....	7	12	Forfeiture of excess of interest.	Grace.
Kentucky.....	6	10	Forfeiture of excess over 10 per cent.	Grace.
Louisiana.....	5	8	Forfeiture of entire interest.	Grace.
Maine.....	6	Any rate.	None.	Grace.
Maryland.....	6	6	Forfeiture of excess of interest.	Grace.
Massachusetts.....	6	Any rate.	None.	Grace.
Michigan.....	7	10	Forfeiture of excess of interest.	Grace.
Minnesota.....	7	10	Forfeiture of excess over 10 per cent.	Grace.
Mississippi.....	6	10	Forfeiture of excess of interest.	Grace.

Interest Laws of the United States—Continued.

Missouri.....	6	10	Forfeiture of entire interest.	Grace.
Montana.....	10	Any rate.	None.	No Grace.
Nebraska.....	7	10	Forfeiture of interest and cost.	Grace.
Nevada.....	10	Any rate.	None.	Grace.
New Hampshire.....	6	6	Forfeiture of thrice the excess.	Grace.
New Jersey.....	6	6	Forfeiture of entire interest.	Grace.
New Mexico.....	6	12	None.	No Grace.
New York*.....	6	6	Forfeiture of principal and interest.	Grace.
North Carolina.....	6	8	Forfeiture of entire interest.	Grace.
Ohio.....	6	8	Forfeiture of excess over 6 per cent.	Grace.
Oregon.....	8	10	Forfeiture of principal and interest.	Grace.
Pennsylvania.....	6	6	Forfeiture of excess of interest.	Grace.
Rhode Island.....	6	Any rate.	None.	Grace.
South Carolina.....	7	Any rate.	None.	Grace.
Tennessee.....	6	10	Forfeiture of excess of interest and \$100 fine.	Grace.
Texas.....	8	12	Forfeiture of entire interest.	Grace.
Utah.....	10	Any rate.	None.	Grace.
Vermont.....	6	6	Forfeiture of excess of interest.	Grace.
Virginia.....	6	8	Forfeiture of excess over 6 per cent.	Grace.
Washington Territory.....	10	Any rate.	None.	Grace.
West Virginia.....	6	6	Forfeiture of excess of interest.	Grace.
Wisconsin.....	7	10	Forfeiture of entire interest.	Grace.
Wyoming.....	12	Any rate.	None.	Grace.
			.....	Grace.

* By an amendment of the law, New York has legalized any rate of interest upon call loans of \$5,000 or upward, on collateral security.

Demand notes are payable upon presentation, without grace, and bear legal State interest after demand for payment has been made.

Each indorser of a joint note becomes liable for the entire amount for which the note is given.

An indorser has the right of action against all persons whose names were previously on a note indorsed by him.

WEIGHTS AND MEASURES.

AVOIRDUPOIS WEIGHT.

16 drams (dr.) . . .	equal 1 ounce,	oz.
16 ounces	" 1 pound,	lb.
25 pounds	" 1 quarter,	qr.
4 quarters	" 1 hundred weight, cwt.	
20 hundred weight	" 1 ton,	T.

The term Avoirdupois is derived from the French *avoir du poids*, signifying "to have weight." The pound consists of 7000 Troy grains. This weight is used for weighing almost all articles except gold, silver, platina, and precious stones, which are weighed by Troy Weight.

LONG TON WEIGHT.

28 lbs.	1 quarter.
4 quarters, or 112 lbs.	1 hundred weight.
20 cwt., or 2240 lbs.	1 ton.

This measurement is nearly obsolete. It is allowed at the Custom House in estimating duties, and in the wholesale Coal and Iron trade.

MISCELLANEOUS WEIGHTS.

14 lbs. Hay	1 Stone.
100 " Grain	1 Cental.
100 " Raisins	1 Cask.
100 " Dry Fish	1 Quintal.
100 " Nails	1 Keg.
196 " Flour	1 Barrel.
200 " Pork	1 Barrel.
240 " Lime	1 Cask.
280 " Salt	1 Barrel.

WEIGHTS AND MEASURES.

THE STONE WEIGHT

So often spoken of in English measures, is 14 lbs. when weighing wool, feathers, hay, etc.; but a stone of beef, fish, butter, cheese, etc., is only 8 pounds.

HAY.

In England, a truss, when new, is 60 lbs., or 56 lbs. of old hay. A truss of straw, 40 lbs. A load of hay is 36 trusses.

In this country, a load is just what it may happen to weigh; and a ton of hay is either 2,000 lbs. or 2,240 lbs., according to the custom of the locality. A bale of hay is generally considered about 300 lbs., but there is no regularity in the weight.

There is no accurate mode of measuring hay but by weighing it. This, on account of its bulk and character, is very difficult, unless it is baled or otherwise compacted. This difficulty has led farmers to estimate the weight by the bulk or cubic contents, a mode which, from the nature of the commodity, is only approximately correct. Some kinds of hay are light, while others are heavy, their equal bulks varying in weight. But for all ordinary farming purposes of estimating the amount of hay in meadows, mows, and stacks, the following rules will be found sufficient:

As nearly as can be ascertained, 25 cubic yards of average meadow hay, in windrows, make a ton.

When well settled in mows or stacks, 15 or 18 cubic yards make a ton.

When taken out of mows or old stacks, and loaded on wagons, 20 or 25 cubic yards make a ton.

Twenty or twenty-five cubic yards of clover, when dry, make a ton.

WEIGHTS AND MEASURES.

TO FIND THE NUMBER OF TONS OF MEADOW HAY
RAKED INTO WINDROWS.

RULE. — Multiply the length of the windrow in yards by the width in yards, and that product by the height in yards, and divide by 25; the quotient will be the number of tons in the windrow.

EXAMPLE. — How many tons of hay in a windrow 40 yards long by 2 wide and 2 high?

SOLUTION. — $40 \times 2 \times 2 = 160 \div 25 = 6\frac{2}{5}$. Ans.

TO FIND THE NUMBER OF TONS OF HAY IN A MOW.

RULE. — Multiply the length in yards by the height in yards, and that by the width in yards, and divide the product by 15; the quotient will be the number of tons.

EXAMPLE. — How many tons of well-settled hay in a mow 10 yards long by 6 wide and 8 high?

SOLUTION. — $10 \times 6 \times 8 = 480 \div 15 = 32$ tons.

TO FIND THE NUMBER OF TONS OF HAY IN OLD STACKS.

RULE. — Find the area of the base in square yards, in the table of areas of circles; then multiply the area of the base by half the altitude of the stack in yards, and divide the product by 15; the quotient will be the number of tons.

EXAMPLE. — How many tons of hay in a circular stack, whose diameter at the base is 8 yards, and height 9 yards.

SOLUTION. — 50.265, area of base in sq. yards, $\times 4\frac{1}{2}$, half the altitude, $= 226.192 \div 15 = 15.079$ tons.

TO FIND THE NUMBER OF TONS IN LONG
SQUARE STACKS.

RULE. — Multiply the length in yards by the width in yards, and that by half the altitude in yards, and divide the product by 15; the quotient will be the number of tons.

WEIGHTS AND MEASURES.

EXAMPLE.—How many tons of hay in a square stack 10 yards long, 5 wide, and 9 high?

SOLUTION.— $10 \times 5 \times 4\frac{1}{2} = 225 \div 15 = 15$ tons.

TO FIND THE NUMBER OF TONS OF HAY WHEN TAKEN OUT OF MOWS OR OLD STACKS.

RULE.—Multiply the length of the load in yards by the width in yards, and that by the height in yards, and divide the product by 20; the quotient will be the number of tons.

EXAMPLE.—How many tons of hay can be taken from an old stack, in a load 6 yards long by 3 wide and 3 high?

SOLUTION.— $6 \times 3 \times 3 = 54 \div 20 = 2\frac{7}{10}$ tons.

These estimates are for medium sized mows or stacks. If the hay is piled to a great height, as it often is where horse hay-forks are used, the mow will be much heavier per cubic yard.

AN EASY MODE OF ASCERTAINING THE VALUE OF A GIVEN NUMBER OF LBS. OF HAY, AT A GIVEN PRICE PER TON OF 2000 LBS.

RULE.—Multiply the number of pounds of hay (coal, or anything else which is bought and sold by the ton) by one half the price per ton, pointing off three figures from the right hand; the remaining figures will be the price of the hay (or any article by the ton).

EXAMPLE.—What will be the cost of 658 lbs. of hay, at \$7.50 per ton?

SOLUTION.—\$7.50 divided by 2 equals \$3.75, by which multiply the number of pounds, thus:

$$\begin{array}{r} 658 \\ \$3.75 \\ \hline \$2.46\|750. \end{array} \quad \text{Ans.}$$

NOTE.—3.75 is $\frac{3}{4}$; therefore $\frac{1}{4}$ of 658 = 82, and $\frac{3}{4}$ is 3 times 82 or \$2.46.

WEIGHTS AND MEASURES.

A BALE OF COTTON

In Egypt is 90 lbs. ; in America a commercial bale is 400 lbs. ; though put up to vary from 280 to 720, in different localities.

A bale or bag of Sea Island cotton is 300 lbs.

WOOL.

In England wool is sold by the sack or boll, of 22 stones, which, at 14 lbs. the stone, is 308 lbs.

A pack of wool is 17 stones and 2 lbs., which is rated as a pack load for a horse. It is 240 lbs. A tod of wool is 2 stones of 14 lbs. A wey of wool is $6\frac{1}{2}$ tods. Two weys, a sack. A clove of wool is half a stone.

A quarter of corn or other grain sold by the bushel is eight imperial bushels, or quarter of a ton.

A ton of liquid measure is 252 gallons.

BUTTER

Is sold by avoirdupois weight, which compares with troy weight as 144 to 175 ; the troy pound being that much lighter. But 175 troy ounces equal 192 of avoirdupois.

A firkin of butter is 56 lbs. ; a tub of butter is 84 lbs.

THE KILOGRAMME OF FRANCE

Is 1000 grammes, and equal to 2 lbs. 2 ozs. 4 grs. avoirdupois.

WEIGHTS AND MEASURES.

COAL.

A cubic foot of anthracite coal, before it is prepared for domestic use, will on an average weigh about 93 lbs. When broken for the market it will average about 54 lbs.

TO ESTIMATE THE WEIGHT OF COAL IN ANY
GIVEN SPACE.

RULE. — Multiply the contents in cubic feet by 54, for anthracite, or by 50, for bituminous coal, and the product will be the weight in pounds.

1. How many tons of anthracite coal, of 2240 lbs. each, can be stored in a bin 28 ft. long, 20 ft. wide, and 4 ft. deep?

ANALYSIS. $28 \times 20 \times 4 \times 54 \div 2240 = 54$ tons.

2. How many pounds of bituminous coal in a car 30 ft. long and 7 ft. wide, the depth of the coal being 16 in.?

3. How many pounds of anthracite coal can be placed in a cart which measures 6 ft. in length, $4\frac{1}{2}$ ft. in width, and 16 in. in depth?

4. I wish to build a bin in my cellar to hold 8 tons of anthracite coal, 2240 lbs. to the ton; I have made the length 12 ft., and the width 10 ft.; what must be the height of the bin?

5. How many pounds of bituminous coal can be stored in a space $50 \times 50 \times 12\frac{1}{2}$ ft.?

6. How many tons of anthracite coal, 2000 lbs. to the ton, can be stored in a yard which measures 60 ft. in length, and 30 ft. in width, the depth of the coal being 6 ft.?

7. A dealer purchases 1500 tons of anthracite coal, 2240 lbs. to the ton, which he wishes to store in an inclosure 100 ft. long, and 80 ft. wide; what will be the depth of the coal?

WEIGHTS AND MEASURES.

TABLE OF AVOIRDUPOIS POUNDS IN A BUSHEL.

COMMODITIES.																
	California.	Connecticut.	Illinois.	Indiana.	Iowa.	Kentucky.	Louisiana.	Maine.	Massachusetts.	Michigan.	Minnesota.	Missouri.	N. Carolina.	N. Hampshire.	New Jersey.	New York.
Barley,	50	48	48	48	48	48	32	46	48	48	48	48	48	48	48	48
Beans, . . . . .	..	60	60	60	60	60	..	..	..	..	..	60	..	..	..	62
Bituminous Coal, . . . . .	..	80	70	80	80	..	..	..	..	..	..	80	..	..	..	..
Blue Grass Seed, . . . . .	..	14	14	14	14	14	..	..	..	..	..	14	..	..	..	..
Buckwheat,	40	45	40	50	52	52	..	46	42	42	42	52	50	50	48	..
Castor Beans, . . . . .	..	46	46	46	46	..	..	..	..	..	..	46	..	..	..	..
Clover Seed, . . . . .	..	60	60	60	60	60	..	63	60	60	60	60	61	60	60	60
Dried Apples, . . . . .	..	24	25	24	..	..	..	..	28	28	28	24	..	..	..	..
Dried Peaches, . . . . .	..	33	33	33	..	..	..	18	28	28	28	33	..	..	..	..
Flax Seed, . . . . .	..	70	56	56	56	56	..	..	..	..	..	56	..	55	55	56
Hemp Seed, . . . . .	..	44	44	44	44	44	..	..	..	..	..	44	..	..	..	..
Indian Corn,	52	56	52	56	56	56	..	56	76	56	56	52	..	..	..	..
Indian Corn in ear, . . . . .	..	70	68	68	..	50	..	50	50	30	32	35	..	..	..	..
Indian Corn Meal,	32	28	32	32	35	33	32	30	30	32	32	35	30	..	30	32
Oats, . . . . .	..	57	48	57	57	..	..	52	..	..	..	57	..	..	..	..
Onions, . . . . .	..	60	60	60	60	60	..	60	56	56	56	60	..	..	..	..
Potatoes, . . . . .	..	54	56	54	56	56	32	50	56	56	56	56	..	..	..	..
Rye, . . . . .	..	..	..	..	..	..	..	50	50	..	..	..	..	..	..	..
Rye Meal, . . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Salt, . . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Timothy Seed, . . . . .	..	45	45	45	45	45	..	..	..	..	..	45	..	..	..	..
Wheat,	60	56	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Wheat Bran, . . . . .	..	20	..	..	20	20	..	..	..	..	..	20	..	..	..	..

The following Table shows the weight of a bushel as prescribed by statute, in the several States named.

RAILROAD FREIGHT.

GROSS WEIGHTS.

The articles named are billed at actual weights, if possible, but usually at the weights in the table below when it is not convenient to weigh them.

Ale and Beer	320 lbs. per bbl.	High wines.....	350 lbs. per bbl.
" "	170 " $\frac{1}{2}$ "	Hung'n Grass Seed	45 " bu.
" "	100 " $\frac{1}{2}$ "	Lime	200 " bbl.
Apples, dried	24 " bu.	Malt.....	38 " bu.
" green.....	56 " "	Millet.....	45 " "
" "	150 " bbl.	Nails	108 " keg.
Barley.....	48 " bu.	Oats	32 " bu.
Beans, white.....	60 " "	Oil.....	400 " bbl.
" castor	46 " "	Onions.....	57 " bu.
Beef	320 " bbl.	Peaches, dried....	33 " "
Bran	20 " bu.	Pork.....	320 " bbl.
Brooms.....	40 " doz.	Potatoes, common	150 " "
Buckwheat	52 " bu.	" "	60 " bu.
Cider	350 " bbl.	" sweet	55 " "
Charcoal.....	22 " bu.	Rye..	56 " "
Clover Seed.....	60 " "	Salt, fine.....	56 " "
Corn.....	56 " "	" "	300 " bbl.
" in ear	70 " "	" coarse.....	350 " "
" Meal	48 " "	" in sacks	200 " sack.
" "	220 " bbl.	Timothy Seed	45 " bu.
Eggs.....	200 " "	Turnips.....	56 " "
Fish	300 " "	Vinegar.....	350 " bbl.
Flax Seed.....	56 " bu.	Wheat.....	60 " bu.
Flour ..	200 " bbl.	Whis'ey	350 " bbl.
Hemp Seed.....	44 " bu.	One ton weight is 2000 lbs.	

NOTE. — From 18,000 to 20,000 lbs. is considered a car-load in most places, each car itself also weighing about 20,000 lbs.

To Estimate Grain Crops per Acre.

Frame together four light sticks, measuring exactly a foot square inside, and with this in one hand, walk into the field and select a spot of fair average yield, and lower the frame square over as many heads as it will inclose, and shell out the heads thus inclosed carefully, and weigh the grain. It is fair to presume that the proportion will be the 43,560th part of an acre's produce. To prove it go through the field and make ten or twenty similar calculations, and estimate by the mean of the whole number of results. It will certainly enable a farmer to make a closer calculation of what a field will produce than he can by guessing.

The Metric System of Weights and Measures,

With their Equivalents According to the System in Use.

MEASURES OF LENGTH.

Metric Denominations and Values.	Equivalents in Denominations in use.
Myriameter..... = 10,000 meters.....	= 6.2137 miles.
Kilometer..... = 1,000 meters.....	= 0.62137 mile or 3,280 ft. 10 in.
Hectometer..... = 100 meters.....	= 328 feet and 1 inch.
Dekameter..... = 10 meters.....	= 393.7 inches.
Meter..... = 1 meter.....	= 39.37 inches.
Decimeter..... = .1 of a meter	= 3.937 inches.
Centimeter..... = .01 of a meter	= 0.3937 inch.
Millimeter..... = .001 of a meter	= 0.0394 inch.

MEASURES OF SURFACE.

Hectare.....	= 10,000 square meters.....	= 2,471 acres.
Are.....	= 100 square meters.....	= 119.6 square yards.
Centare.....	= 1 square meter.....	= 1,550 square inches.

MEASURES OF CAPACITY.

Names.	No. Liters.	Cubic Measure.	Dry Measure.	Wine Measure
Kiloliter..	= 1,000....	= 1 meter... =	1,308 cub. yds..	= 264.17 galls.
Hectoliter.=	100....	= .1 meter... =	2 bu. 3.35 pks..	= 26.417 galls.
Decaliter. =	10....	= 10 decim... =	9.08 quarts.....	= 2.6417 galls.
Liter..... =	1....	= 1 decim... =	0.908 quart.....	= 1.0567 qts.
Deciliter. =	.1 ...	= .1 decim... =	6.1022 cub. in..	= 0.845 gill.
Centiliter. =	.01 ...	= 10 centim.. =	0.6102 cub. in..	= 0.338 fl'd oz.
Milliliter. =	.001....	= 1 centim.. =	0.061 cub. in..	= 0.27 fluid dr.

WEIGHTS.

Names.	No. Grams.	Weight of what quantity of water at maximum density.	Avoirdupois Weight.
Millier or tonneau..	= 1,000,000....	= 1 cubic meter....	= 2204.6 lbs.
Quintal.....	= 100,000....	= 1 hectoliter	= 220.46 lbs.
Myriagram.....	= 10,000....	= 10 liters	= 22.046 lbs.
Kilogram or Kilo ..	= 1,000....	= 1 liter	= 2.2046 lbs.
Hectogram.....	= 100....	= 1 deciliter	= 3.5274 oz.
Dekagram.....	= 10....	= 1 c. centimet.....	= 0.3527 oz.
Gram.....	= 1....	= 1 c. centimet.....	= 15.432 gra.
Decigram.....	= .1 ...	= 1 c. centimet.....	= 1.5432 gra.
Centigram.....	= .01....	= 10 c. millimet.....	= 0.1543 gr.
Milligram.....	= .001....	= 1 c. millimet. . .	= 0.0154 gr.

Inches.	Agals.	Nonpareil.	Stron.	Printer.	Longest.	Inches.
1	1	1	1	1	1	1
2	2	2	2	2	2	2
3	3	3	3	3	3	3
4	4	4	4	4	4	4
5	5	5	5	5	5	5
6	6	6	6	6	6	6
7	7	7	7	7	7	7
8	8	8	8	8	8	8
9	9	9	9	9	9	9
10	10	10	10	10	10	10
11	11	11	11	11	11	11
12	12	12	12	12	12	12
13	13	13	13	13	13	13
14	14	14	14	14	14	14
15	15	15	15	15	15	15
16	16	16	16	16	16	16
17	17	17	17	17	17	17
18	18	18	18	18	18	18
19	19	19	19	19	19	19
20	20	20	20	20	20	20
21	21	21	21	21	21	21
22	22	22	22	22	22	22
23	23	23	23	23	23	23
24	24	24	24	24	24	24
25	25	25	25	25	25	25
26	26	26	26	26	26	26
27	27	27	27	27	27	27
28	28	28	28	28	28	28
29	29	29	29	29	29	29
30	30	30	30	30	30	30
31	31	31	31	31	31	31
32	32	32	32	32	32	32
33	33	33	33	33	33	33
34	34	34	34	34	34	34
35	35	35	35	35	35	35
36	36	36	36	36	36	36
37	37	37	37	37	37	37
38	38	38	38	38	38	38
39	39	39	39	39	39	39
40	40	40	40	40	40	40
41	41	41	41	41	41	41
42	42	42	42	42	42	42
43	43	43	43	43	43	43
44	44	44	44	44	44	44
45	45	45	45	45	45	45
46	46	46	46	46	46	46
47	47	47	47	47	47	47
48	48	48	48	48	48	48
49	49	49	49	49	49	49
50	50	50	50	50	50	50
51	51	51	51	51	51	51
52	52	52	52	52	52	52
53	53	53	53	53	53	53
54	54	54	54	54	54	54
55	55	55	55	55	55	55
56	56	56	56	56	56	56
57	57	57	57	57	57	57
58	58	58	58	58	58	58
59	59	59	59	59	59	59
60	60	60	60	60	60	60
61	61	61	61	61	61	61
62	62	62	62	62	62	62
63	63	63	63	63	63	63
64	64	64	64	64	64	64
65	65	65	65	65	65	65
66	66	66	66	66	66	66
67	67	67	67	67	67	67
68	68	68	68	68	68	68
69	69	69	69	69	69	69
70	70	70	70	70	70	70
71	71	71	71	71	71	71
72	72	72	72	72	72	72
73	73	73	73	73	73	73
74	74	74	74	74	74	74
75	75	75	75	75	75	75
76	76	76	76	76	76	76
77	77	77	77	77	77	77
78	78	78	78	78	78	78
79	79	79	79	79	79	79
80	80	80	80	80	80	80
81	81	81	81	81	81	81
82	82	82	82	82	82	82
83	83	83	83	83	83	83
84	84	84	84	84	84	84
85	85	85	85	85	85	85

THE METRIC SYSTEM.

1 CENTIMETER
10 MILLIMETERS

This is a system adopted first in France about the beginning of the present century. The absence of a common system of weights and measures among the different nations of the world was a constant source of embarrassment in trade, and it was to overcome this difficulty that the system under discussion was originated. Its supporters claim that it thoroughly meets the requirements, and that its convenience for the purposes of commerce will make its universal adoption a question of time only. It is already in use in France, Germany, Spain, Italy, Portugal, Holland, Belgium, Mexico, Switzerland, Austria, Denmark, Greece, Brazil and a majority of the South American States. It was legalized in Great Britain in 1864, and its use was authorized in the United States by act of Congress, 1866.

The metric system is based upon a standard measure called a meter, from the Greek *Metron* (a measure). The meter is one-tenth of the earth's quadrant; or, in other words, 10,000,000 meters would reach from the equator to either pole, and is consequently one-fourth of the polar circumference of the earth. The meter is 39.37 inches in length.

Each metric table has its unit, and these units are uniformly multiplied and divided by ten. The multiples and divisors are indicated by prefixes placed before the several fundamental units. The multiples are taken from the Greek, and are as follows:

Deca, which means *Ten*.
Hecto, " *Hundred*.
Kilo, " *Thousand*.
Myria, " *Ten Thousand*.

The divisors (or sub-multiples) are taken from the Latin, and are as follows:

Deci, which means *Tenth*.
Centi, " *Hundredth*.
Milli, " *Thousandth*.

The diagram herewith shows the divisions of the Metric linear measure up to 6 inches. It will be seen that an inch is equal to about 25 Millimeters. Also, that 4

1 DECIMETER
10 CENTIMETERS
100 MILLIMETERS

inches are just about equivalent to 10 Centimeters, or 1 Decimeter.

The Metric system comprises five standard units.

The *Meter* is the unit of measures of length (and, as has been before stated, it forms the basis of the entire system). It is 39.37 inches.

The *Are* is the unit of square measure. It is the area of a square whose side is 10 Meters. An *Are* is equal to 119 609 square yards.

The *Liter* is the unit of measures of capacity (both liquid and dry), and is the cube of the tenth part of a Meter. A *Liter* is equal to .908 of a quart Dry, or 1.0567 quarts Liquid Measure.

The *Gramme* is the unit of measures of weight. It is the weight of the one-thousandth part of a *Liter* of pure water at 62 degrees Fahrenheit; and when made in the form of a cube its edge in length equals the one-hundredth part of a Meter. A *Gramme* is equal to 15.432 grains Troy Weight, or .03527 of an ounce Avoirdupois.

For convenience we show in the accompanying diagram, scales of the five most important sizes of type used in general newspaper work.

15 CENTIMETERS

WEIGHTS AND MEASURES.

LIQUID OR WINE MEASURE.

4 gills (gi.)	equal 1 pint, . . . pt.
2 pints	" 1 quart, . . . qt.
4 quarts	" 1 gallon, . . gal.

The standard liquid gallon contains 231 cubic inches. — In the old tables were given $31\frac{1}{2}$ gallons = 1 barrel; 63 gallons = 1 hoghead; 1 hogheads = 1 pipe; 2 pipes = 1 tun. These are now obsolete, because scarcely any cask holds exactly the same amount of liquid.

Square Cisterns.

RULE.—Multiply the length in inches by the width in inches, and that product by the depth in inches, and divide the whole product by 231.

EXAMPLE.—How many gallons in a cistern 6 feet long, 3 feet wide, and 4 feet deep.

SOLUTION.—72 inches in length X 36 inches' width X 48 inches' depth = $124416 \div 231 = 538.59$ gals.

Approximate Method for Square Cisterns.

RULE. Divide the solid contents in feet by 4, and you will have the contents in barrels of $31\frac{1}{2}$ gallons each.

Take the preceding example: $6 \times 3 \times 4 \div 4 = 18$ barrels.

NOTE.—This rule gives only the approximate contents, and is based on the following: There are $31\frac{1}{2}$ gallons in a bbl., and 231 cubic inches in a gallon, which, divided by 1728, the number of cubic inches in a foot, we have about 4, and for ordinary calculation often gives the correct quantity for many practical purposes.

Approximate Method for Round Cisterns.

RULE.—Multiply the depth in feet by the diameter in feet, and that product by $1\frac{1}{2}$, and you have the number of barrels of $31\frac{1}{2}$ gallons each.

EXAMPLE.—How many barrels in a round cistern 8 feet deep by 5 feet in diameter?

SOLUTION.— $8 \times 5 \times 1\frac{1}{2} = 60$ barrels.

WEIGHTS AND MEASURES.

Capacity of Round Cisterns or Tanks.

Tabular view of the number of gallons contained in the clear between the brickwork for each ten inches in depth :

DIAMETER.	GALLONS.	DIAMETER.	GALLONS.
2 feet equal.....	19	8 feet equal.....	313
2½ " "	30	8½ " "	353
3 " "	44	9 " "	396
3½ " "	60	9½ " "	461
4 " "	78	10 " "	489
4½ " "	97	11 " "	592
5 " "	122	12 " "	705
5½ " "	148	13 " "	827
6 " "	176	14 " "	959
6½ " "	207	15 " "	1101
7 " "	240	20 " "	1958
7½ " "	275	25 " "	3059

Circular Cisterns.

RULE.—Find the area of the circle by our table of multiples; then multiply this by the depth in inches, and divide this product by 231.

EXAMPLE.—A cistern is 8 feet in diameter by 5 feet deep. How many gallons does it contain.

SOLUTION.—Multiply the area by 96 inches, the diameter = 7238.2 X 60 inches, the depth = 43429.20 ÷ 231 = 180 gallons. Ans.

Another Rule for the Measurement of Cylindrical Cisterns.

Take the length, width and depth in feet; multiply these together, and the product by 1865; cut off four figures on the right, and the result will be the contents in barrels.

EXAMPLE.—Find the contents of a cistern 6 feet in diameter and 9 feet deep. Six feet, the length, multiplied by 6 feet, the breadth, and the product by 9, the depth, gives 324, which multiplied by 1865, and four figures cut off, gives 60 barrels and a decimal.

In this case we consider the diameter as being both length and breadth. The reason of the rule is this: a cylinder one foot in diameter and one foot long would measure 1865 ten-thousandths of a barrel. A cylinder 9 times as long would contain 9 times as much, and 6 times as wide, 6 times as much as that. The number 1865 is easy to remember as it corresponds with the number of a year.

WEIGHTS AND MEASURES.

ALE OR BEER MEASURE.

2 pints (pt.) . . .	equal 1 quart, . . .	qt.
4 quarts	" 1 gallon, . . .	gal.
36 gallons	" 1 barrel, . . .	bbl.
54 gallons	" 1 hogshead, . .	hhd.

Ale or Beer Measure is used in measuring ale, beer, etc. The gallon consists of 282 cubic inches.

TROY WEIGHT.

24 grains (gr.) . .	equal 1 pennyweight, dwt.
20 pennyweights .	" 1 ounce, . . . oz.
12 ounces	" 1 pound, . . . lb.

The term Troy is said to be derived from *Troyes*, the name of a town in France, where the weight was first used in Europe. The symbol (oz.) is from the Spanish word *onza*, for ounce, and (lb.) from *libra*, a pound.

APOTHECARIES' WEIGHT.

20 grains (gr.) . .	equal 1 scruple, . . .	℞
3 scruples	" 1 dram,	ʒ
8 drams	" 1 ounce,	℥
12 ounces	" 1 pound,	℔

This weight is used in mixing and retailing medicines. The pound is the same as the pound Troy.

T I M E.

60 seconds (sec.) . .	equal 1 minute, . .	m.
60 minutes	" 1 hour,	hr.
24 hours	" 1 day,	da.
7 days	" 1 week,	wk.
4 weeks	" 1 month,	mo.
52 weeks	" 1 year,	yr.
12 calendar months .	" 1 year,	yr.

SIGNS AND ABBREVIATIONS USED BY PHYSICIANS IN PRESCRIPTIONS, MEDICAL BOOKS AND JOURNALS.

R. <i>Receipt.</i> Take.	F. <i>Fiat.</i> Let it be made.
℥, ℥ss, ana, <i>utriusque.</i> Of each.	F. Pil. <i>Fiat pilula.</i> Make into a pill.
lb <i>Libra.</i> A pound.	Feb. Dur. <i>Febre durante.</i> During the fever.
℥ <i>Uncia.</i> An ounce.	Fl. <i>Fluidus.</i> Fluid.
℥ss <i>Fluiduncia.</i> A fluid ounce.	Gr. <i>Grannum.</i> A grain.
℥ <i>Drachma.</i> A drachm.	Gt. <i>Gutta.</i> A drop.—Gtt. <i>Guttae.</i> Drops.
℥ss <i>Fluidrachma.</i> A fluid drachm.	Guttat. <i>Guttatim.</i> By drops.
℥ <i>Scrupulum.</i> A scruple.	Hor. Decub. <i>Hora decubitus.</i> At bed-time.
ss. <i>Semissis.</i> Half.	H. S. <i>Hora somni.</i> At bed-time
iss. <i>Sesqui.</i> One and a half.	Lb. and Lib. <i>Libra.</i> A pound weight.
Abdom. <i>Abdomen.</i>	Liq. <i>Liquor.</i>
Abs. <i>Febr. Absente febre.</i> In the absence of fever.	M. <i>Misce.</i> Mix.
Ad., or Add. <i>Adde, or Addatur.</i> Add, or let there be added.	Man. <i>Minipulus.</i> A handful.
Ad Lib. <i>Ad libitum.</i> At pleasure.	Mic. Pan. <i>Mica Panis.</i> Crumb of bread.
Altern. Hor. <i>Alternis horis.</i> Every other hour.	Min. <i>Minimum.</i> The sixtieth part of a drachm by measure.
Aq. <i>Aqua.</i> Water.	Mist. <i>Mistura.</i> A mixture.
Aq. Bull. <i>Aqua bulliens.</i> Boiling water.	Muc. <i>Mucilago.</i> Mucilage.
Aq. Comm. <i>Aqua communis.</i> Common water.	O. <i>Octarius.</i> A pint.
Aq. Ferv. <i>Aqua fervens.</i> Hot water.	Ol. <i>Oleum.</i> Oil.
Aq. Font. <i>Aqua fontis.</i> Spring water.	Omn. Hor. <i>Omni hora.</i> Every hour.
B. A. <i>Balneum arenae.</i> A Sand bath.	Omn. Man. <i>Omni Mane.</i> Every morning.
Bib. <i>Bibe.</i> Drink.	Omn. nocte. <i>Every night.</i>
Bis Ind. <i>Bis indies.</i> Twice daily.	Oz. <i>Uncia.</i> An ounce.
Bol. <i>Bolus.</i> A large pill.	P. Æ. <i>Partes aequales.</i> Equal parts.
Bull. <i>Bulliat.</i> Let it boil.	Pil. <i>Pilula.</i> A pill.
B. V. <i>Balneum vaporis.</i> A vapor bath.	P. R. N. <i>Pro re nata.</i> As occasion may require.
Cap. <i>Capiat.</i> Let him take.	Pulv. <i>Pulvis.</i> A powder.
Chart. <i>Chartula.</i> A small paper.	Q. S. <i>Quantum sufficit.</i> As much as is sufficient.
Cochl. <i>Cochleare.</i> A spoonful.	Rad. <i>Radix.</i> Root.
Col. <i>Cola.</i> Strain.	Rep. <i>Repetatur.</i> Let it be repeated.
Collyr. <i>Collyrium.</i> An eye water.	S. <i>Signa.</i> Write.
Comp. <i>Compositus.</i> Compound.	S. A. <i>Secundum artem.</i> According to art.
C., or Cong. <i>Congius.</i> A gallon.	Sem. <i>Semen.</i> Seed.
Coq. <i>Coque.</i> Boil.	Si Non Val. <i>Si non valeat.</i> If it does not answer.
Cort. <i>Cortex.</i> Bark.	Si Op. Sit. <i>Si opus sit.</i> If there be need.
C. M. <i>Cras Mane.</i> To-morrow morning.	Sing. <i>Singulorum.</i> Of each.
C. N. <i>Cras nocte.</i> To-morrow night.	Solv. <i>Solve.</i> Dissolve.
Crastr. <i>Crastinus.</i> For to-morrow.	Sp. <i>Spiritus.</i> Spirit.
D. <i>Detur.</i> Let it be given.	Sum. <i>Sumat.</i> Let him take.
Decub. <i>Decubitus.</i> Lying down.	Sp. Vin. <i>Spiritus vini.</i> Spirit of wine.
De D. in D. <i>De die in diem.</i> From day to day.	Syr. <i>Syrupus.</i> Syrup.
Dig. <i>Digeratur.</i> Let it be digested.	Tr. Tinct. <i>Tinctura.</i> Tincture.
Dil. <i>Dilutus.</i> Dilute.	Va. <i>Venasectio.</i> Venesection.
Dim. <i>Dimidius.</i> One-half.	
Div. <i>Divide.</i> Divide.	
Enem. <i>Enema.</i> A clyster.	

WEIGHTS AND MEASURES.

DRY MEASURE.

2 pints (pt.) . . .	equal 1 quart,	qt.
8 quarts	" 1 peck,	pk.
4 pecks	" 1 bushel, . . .	bu.
36 bushels	" 1 chaldron, . .	ch.

Dry Measure is used for measuring grain, fruit, coal, etc.

To Measure Corn in the Crib.

When the crib is equilateral.

Rule.—Multiply the length in feet by the breadth in feet, and that again by the height in feet, which last product multiply by .63 (the fractional part of a heaped bushel in a cubic foot), and the result will be the heaped bushels of ears. For the number of bushels of shelled corn, multiply by $4\frac{2}{3}$ (two-thirds of .63), instead of .63.

EXAMPLE.—Required the number of bushels of shelled corn contained in a crib of ears, 15 feet long by 5 feet wide, and 10 feet high?

15, length, X 5, width, X 10, height, = 750 cubic ft.
Then $750 \times .63 = 472.50$ heaped bushels of ears.
Also $750 \times .42 = 315$ bushels of shelled corn.

In measuring the height, of course the height of the corn is intended. And there will be found to be a difference in measuring corn in this mode between fall and spring, because it shrinks very much in the winter and spring, and settles down.

When the crib is flared at the sides.

Rule.—Multiply half the sum of the top and bottom widths in feet by the perpendicular height in feet, and that again by the length in feet, which last product multiply by .63 for heaped bushels of ears, and by .42 for the number of bushels of shelled corn.

WEIGHTS AND MEASURES.

LONG MEASURE.

12 inches (in.) . . .	equal 1 foot,	ft.
3 feet	" 1 yard,	yd.
$5\frac{1}{2}$ yards	" 1 rod,	rd.
40 rods	" 1 furlong, . .	fur.
8 furlongs	" 1 mile,	m.

The yard is the standard unit of length. It is formed by dividing a pendulum, which vibrates seconds in a vacuum, at the level of the sea, at the latitude of London, into 391,393 equal parts and taking 360,000 of these parts. From this unit all other measures and weights are derived.

NOTE.—*Cloth measure* is practically out of use. In measuring goods sold by the yard, the yard is divided into *halves*, *fourths*, *eighths* and *sixteenths*. At United States Custom Houses, in estimating duties, the yard is divided into *tenths* and *hundredths*.

For Measuring Heights and Distances.

3 inches, ,	1 palm.
4 "	1 hand.
9 "	1 span.
$3\frac{2}{10}$ feet,	1 pace.

Mariner's Measure.

Table used by Mariners in calculating distances on water, and the speed of vessels.

9 inches,	1 span.
8 spans or 6 ft.,	1 fathom.
120 fathoms,	1 cable's length.
$7\frac{1}{8}$ cables,	1 mile or knot.
6086 ft. nearly,	1 " " "
3 miles, or knots,	1 league.

NOTE.—The number of knots of the log line run off in half a minute indicates the number of knots of distance a vessel goes per hour. A nautical mile or knot equals nearly $1\frac{1}{6}$ statute miles.

WEIGHTS AND MEASURES.

Surveyor's Square Measure.

Used for measuring the area or contents of fields, farms, and government lands.

TABLE.

625 Square links (sq. l.), . . .	1 pole, P.
16 Poles,	1 square chain, sq. ch.
10 Square Chains,	1 acre, A.
640 Acres,	1 square mile, sq. m.
36 Square Miles (6 miles sq.)	1 township, Tp.

Government Land Measure.

A township—36 sections, each a mile square.

A section—640 acres.

A quarter section, half a mile square—160 acres.

An eighth section, half a mile long, north and south, and a quarter of a mile wide—80 acres.

A sixteenth section, a quarter of a mile square—40 acres.

The sections are all numbered 1 to 36, commencing at the northeast corner, thus :

6	5	4	3	2	NW SW	NE SE
7	8	9	10	11	12	
18	17	16	15	14	13	
19	20	21	22	23	24	
30	29	28	27	26	25	
31	32	33	34	35	36	

The sections are all divided into quarters, which are named by the cardinal points, as in section 1. The quarters are divided in the same way. The description of a forty-acre lot would read: The south half of the

west half of the south-west quarter of section 1 in township 24, north of range 7 west, or as the case might be; and sometimes will fall short, and sometimes overrun the number of acres it is supposed to contain.

WEIGHTS AND MEASURES.

Surveyor's Long Measure,*For measuring boundaries of land, areas, railroads, canals.*

$7\frac{82}{100}$ inches	1 link.
25 links,	1 rod.
4 rods,	1 chain.
80 chains,	1 mile.
10 chains long by 1 broad, or 10 sq. chains, 1 acre.	

GUNTER'S CHAIN, which is the unit of measure used by surveyors, is 66 feet long, consisting of 100 links.

Measurements are recorded in chains and hundredths. Latterly a steel measuring tape 100 feet long, with each foot divided into tenths, is used by engineers as a substitute for the cumbersome chain.

NOTE. — By scientific persons and revenue officers the inch is divided into *tenths*, *hundredths*, etc. Among mechanics the inch is divided into *eighths*. The division of the inch into 12 parts, called lines, is not now in use.

A standard English mile, which is the measure we use, is 5280 feet in length, 1760 yards, or 320 rods. A strip one rod wide and one mile long is two acres. By this it is easy to calculate the quantity of land taken up by roads, and also how much is wasted by fences.

TABLE*For Geographical and Astronomical Calculations.*

1 Geographic mile,	1.15 statute miles.
3 " "	1 league.
60 " " " or	69.16 statute miles, 1 degrec.
360 Degrees,	Circumference of the earth.

NOTE. — The earth's circumference is $24,855\frac{1}{2}$ miles, nearly. The nautical mile is $6075\frac{1}{2}$ feet, or $795\frac{1}{2}$ feet longer than the common mile.

WEIGHTS AND MEASURES.

Shoemaker's Measure.

3 Barleycorns or sizes, 1 inch.

Number one, *children's measure*, is $4\frac{2}{3}$ inches, and every additional number calls for an increase of $\frac{1}{3}$ of an inch in length. Number one, *adults' measure*, is $8\frac{1}{2}$ inches long, with a gradual increase of $\frac{1}{3}$ of an inch for additional numbers, so that, for example, number ten measures $11\frac{1}{2}$ inches. This measure corresponds to the number of the *last*, and not to the length of the *sole*.

Surface or Square Measure,

USED IN ASCERTAINING THE EXTENT OF SURFACES,
SUCH AS LAND, BOARDS, PLASTERING, PAVING, ETC.

TABLE.

144 Square Inches (sq. in.)	1 square foot, sq. ft.
9 Square Feet,	1 square yard, sq. yd.
$30\frac{1}{4}$ Square Yards,	1 sq. rod or perch, sq. rd.; P.
160 Square Rods,	1 acre, A.
640 Acres,	1 square mile, sq. mi.

Measure 209 feet on each side, and you have a square acre within an inch.

NOTE. — The following gives the comparative size, in square yards, of acres in different countries :

English acre, 4840 square yards; Scotch, 6150; Irish, 7840; Hamburg, 11,545; Amsterdam, 9722; Dantzic, 6650; France (hectare), 11,960; Prussia (morgen), 3053.

This difference should be borne in mind in reading of the products per acre in different countries. Our land measure is that of England.

ARTIFICERS estimate their work as follows :

By the *square foot*; as in glazing, stone-cutting, etc.

By the *square yard*, or by the *square* of 100 square feet; as in plastering, flooring, roofing, paving, etc.

WEIGHTS AND MEASURES.

CUBIC MEASURE.

TABLE.

1728 cubic inches (cu. in.), . . .	1 cubic foot, cu. ft.
27 cubic feet,	1 cubic yard, cu. yd.
40 cubic ft. of round timber or	} 1 ton or load, T.
50 cubic feet of hewn timber	
16 cubic feet,	1 cord foot, cd. ft.
8 cord feet or	}
128 cubic feet	
24 $\frac{3}{4}$ cubic feet,	1 perch or stone, or masonry, Pch.

TO FIND THE CUBIC CONTENTS OF ANY SOLID BODY.

RULE. — Multiply the length by the breadth, and that product by the thickness.

NOTES.—1. A load of earth contains a cubic yard, and weighs about 3250 lbs.

2. Railway and transportation companies estimate light freight by the number of cubic feet it occupies ; but heavy freight is estimated by weight.

3. A pile of wood 4 feet wide, 4 ft. high, and 8 ft. long, contains 1 *cord*; and a *cord foot* is 1 foot in length of such a pile.

4. A perch of stone or masonry is 16 $\frac{1}{2}$ feet long, 1 $\frac{1}{2}$ feet wide, and 1 foot high, and contains 24 $\frac{3}{4}$ cubic feet.

5. A brick is usually 8 inches long, 4 inches wide, and 2 inches thick ; hence 27 bricks make a cubic foot.

6. Joiners, painters, and masons make no allowance for windows, doors, etc. In some places it is customary to allow for one-half the opening. Masons make no allowance for the corners of the walls of houses or of cellars. The size of a cellar is estimated by the measurement of the outside of the wall.

WEIGHTS AND MEASURES.

Ton Weight and Ton Measure.

A ton of hay, or any other coarse bulky article usually sold by that measure, is 20 gross hundreds, that is 2240 lbs. But in many places it has become the custom to count only 2000 lbs. for a ton. In freighting ships 42 cubic feet are allowed to a ton; in the measurement of timber 40 solid feet if round, and 50 if square, make a ton.

MASONRY.

A perch of stone is 24.75 cubic feet; when built in the wall, 22 cubic feet make 1 perch, $2\frac{3}{4}$ cubic feet being allowed for the mortar and filling.

Three pecks of lime and four bushels of sand to a perch of wall.

To find the number of perches of stone in walls.

RULE.—Multiply the length in feet by the height in feet, and that by the thickness in feet, and divide the product by 22, and the quotient will be the number of perches of stone in the wall.

EXAMPLE.—How many perches of stone contained in a wall 40 ft. long, 20 ft. high, and 18 inches thick?

SOLUTION.—40 ft., length, \times 20 ft., height, \times $1\frac{1}{2}$ ft., thickness, $= 1200 \div 22 = 54.54$ perches. Ans.

NOTE.—To find the number of perches of *masonry*, divide the product, as above, by 24.75, instead of 22.

Brickwork.

The dimensions of common bricks are from $7\frac{3}{4}$ to 8 inches long, by $4\frac{1}{4}$ wide, and $2\frac{1}{2}$ thick. Front bricks are $8\frac{1}{4}$ inches long, by $4\frac{1}{2}$ wide, and $2\frac{1}{2}$ thick.

The usual size of fire bricks is $9\frac{1}{8}$ inches long, by $4\frac{5}{8}$ wide, by $2\frac{3}{8}$ thick.

WEIGHTS AND MEASURES.

Twenty common bricks to a cubic foot when laid;
15 common bricks to a foot of 8-inch wall when laid.

To find the number of common bricks in a wall.

RULE.—Multiply the length of the wall in feet by the height in feet, and that by its thickness in feet, and that again by 20, and the product will be the number of bricks in the wall.

EXAMPLE.—How many common bricks in a wall 40 feet long by 20 feet high and 12 inches thick?

SOLUTION.—40 ft., length, \times 20 ft., height, \times 1 ft., thick, \times 20 = 16,000. Ans.

NOTE.—For walls 8 inches thick, multiply the length in feet by the height in feet, and that by 15, and the product will be the number of bricks in the wall.

When the wall is perforated by doors and windows, or other openings, find the sum of their cubic feet by severally multiplying their lengths and widths and thicknesses in feet together, and deducting the whole from the cubic contents of the wall, including the openings, before multiplying by 15 or 20, as above.

Laths.

Laths are $1\frac{1}{4}$ to $1\frac{1}{2}$ inches wide by 4 feet long, are usually set $\frac{1}{4}$ inch apart, and a bundle contains 100.

Short Approximate Method for Estimating Stone Work.

RULE.—Multiply the length in feet by the height in feet by the thickness in feet, and that product by 4, cutting off the two right-hand figures.

EXAMPLE.—How many perches of stone in a wall 40 ft. long, 20 ft. high, and 2 ft. thick?

$40 \times 20 \times 2 \times 4 = 64.00$, or 64 perches.

CARPENTERS' ESTIMATES.

SHINGLES are usually 16 inches long and, on an average, very nearly 4 inches wide.

They are put up in bundles 20 inches wide and of 24 courses. Four such bundles contain 1000 of shingles.

1000 of shingles laid 4 inches to the weather are estimated to cover 109 square feet; laid $4\frac{1}{2}$ inches to the weather, to cover 120 square feet; and laid 5 inches to the weather, to cover 133 square feet.

For laying 1000 shingles carpenters allow about 6 pounds of 4-penny nails, or 5 pounds 3-penny nails.

NUMBER OF SHINGLES IN A ROOF. First find the number of square inches in one side of the roof; cut off the right hand or unit figure, and the result will be the number of shingles required to cover both sides of the roof, laying five inches to the weather. The ridge-board provides for the double courses at the bottom. Illustration: Length of roof, 100 feet, width of one side, 30 feet. — $100 \times 30 \times 44 = 432,000$. Cutting off the right-hand figure, we have 43,200 as the number of shingles required.

CLAPBOARDS are usually 4 feet long, and are estimated by the 1000.

100 of clapboards laid 4 inches to the weather are estimated to cover $133\frac{1}{3}$ square feet; laid $4\frac{1}{2}$ inches to the weather, to cover 150 square feet; and laid 5 inches to the weather, to cover $166\frac{2}{3}$ square feet.

For laying 100 of clapboards carpenters allow about $3\frac{1}{2}$ pounds of 5-penny nails.

LATHS are usually 4 feet long, $1\frac{1}{2}$ inches wide, and $\frac{1}{4}$ inch thick, and are put up in bundles containing 100.

1000 of laths, set $\frac{1}{4}$ of an inch apart, are estimated to cover 55 square yards.

For setting 1000 of laths carpenters allow about 7 pounds of 3-penny fine nails.

TABLE OF MULTIPLES.

For the practical convenience of those who have occasion to refer to mensuration, we have arranged the following useful Table of Multiples. It covers the whole ground of practical Geometry.

-
- Diameter of a circle $\times 3.1416 =$ Circumference.
 Radius of a circle $\times 6.283185 =$ Circumference.
 Square of the radius of a circle $\times 3.1416 =$ Area.
 Square of the diameter of a circle $\times 0.7854 =$ Area.
 Square of the circumference of a circle $\times 0.07958 =$ Area.
 Half the circumference of a circle \times by half its diameter $=$ Area.
 Circumference of a circle $\times 0.159155 =$ Radius.
 Square root of the area of a circle $\times 0.56419 =$ Radius.
 Circumference of a circle $\times 0.31831 =$ Diameter.
 Square root of the area of a circle $\times 1.12839 =$ Diameter.
 Diameter of a circle $\times 0.86 =$ Side of inscribed equilateral triangle.
 Diameter of a circle $\times 0.7071 =$ Side of an inscribed square.
 Circumference of a circle $\times 0.226 =$ Side of an inscribed Square.
 Circumference of a circle $\times 0.282 =$ Side of an equal square.
 Diameter of a circle $\times 0.8862 =$ Side of an equal square.
 Base of a triangle \times by $\frac{1}{2}$ the altitude $=$ Area.
 Multiply both diameters and .7854 together $=$ Area of an ellipse.
 Surface of a sphere \times by 1.6 of its diameter $=$ Solidity.
 Circumference of a sphere \times by its diameter $=$ Surface.
 Square of the diameter of a sphere $\times 3.1416 =$ Surface.
 Square of the circumference of a sphere $\times 0.3183 =$ Surface.
 Cube of the diameter of a sphere $\times 0.5236 =$ Solidity.
 Cube of the radius of a sphere $\times 4.1888 =$ Solidity.
 Cube of the circumference of a sphere $\times 0.016887 =$ Solidity.
 Square root of the surface of a sphere $\times 0.56419 =$ Diameter.
 Square root of the surface of a sphere $\times 1.772454 =$ Circumference.
 Cube root of the solidity of a sphere $\times 1.2407 =$ Diameter.
 Cube root of the solidity of a sphere $\times 3.8978 =$ Circumference.
 Radius of a sphere $\times 1.1547 =$ Side of an inscribed cube.
 Square root of (1.3 of the square of) the diameter of a sphere $=$ Side of inscribed cube.
 Area of its base \times by 1.3 of its altitude $=$ Solidity of a cone or pyramid whether round, square, or triangular.
 Area of one of its sides $\times 6 =$ Surface of a cube.
 Altitude of trapezoid $\times \frac{1}{2}$ the sum of its parallel sides $=$ Area.

Paper Table for Printers' and Publishers' Use,

Showing the quantity of paper required for printing 1000 copies (including 56 extra copies to allow for wastage), of any usual sized Book from 8vo. down to 32mo. If the quantity required is not found in the Table, double or treble some suitable number of pages or quantity of paper.

No. of Forms.	8vo. Pages.	12mo. Pages.	16mo. Pages.	24mo. Pages.	32mo. Pages.	1000 Copies.	
						Rs.	Qs.
1	8	12	16	24	32	1	2
2	16	24	32	48	64	2	4
3	24	36	48	72	96	3	6
4	32	48	64	96	128	4	8
5	40	60	80	120	160	5	10
6	48	72	96	144	192	6	12
7	56	84	112	168	224	7	14
8	64	96	128	192	256	8	16
9	72	108	144	216	288	9	18
10	80	120	160	240	320	11	
11	88	132	176	264	352	12	2
12	96	144	192	288	384	13	4
13	104	156	208	312	416	14	6
14	112	168	224	336	448	15	8
15	120	180	240	360	480	16	10
16	128	192	256	384	512	17	12
17	136	204	272	408		18	14
18	144	216	288	432		19	16
19	152	228	304	456		20	18
20	160	240	320	480		22	
21	168	252	336	504		23	2
22	176	264	352			24	4
23	184	276	368			25	6
24	192	288	384			26	8
25	200	300	400			27	10
26	208	312	416			28	12
27	216	324	432			29	14
28	224	336	448			30	16
29	232	348	464			31	18
30	240	360	480			33	
31	248	372	496			34	2
32	256	384	512			35	4
33	264	396	528			36	6
34	272	408	544			37	8
35	280	420	560			38	10
36	288	432	576			39	12
37	296	444	592			40	14
38	304	456	608			41	16
39	312	468				42	18
40	320	480				44	

Names and Dimensions of Various Sizes of Paper.

P R I N T.

Medium.....	19 x 24	Double Medium.	24 x 38
Royal (20 x 24) .	20 x 25	Double Royal...	26 x 40
Super Royal,....	22 x 28	D'ble Super Roy'l	28 x 42
Imperial,	22 x 32	D'ble Super Roy'l	29 x 43
Med'm and a half,	24 x 30	Broad Twelves ..	23 x 41
Small Double Me-		Double Imperial.	32 x 46
dium	24 x 36		

F O L D E D.

Billet Note	6 x 8	Letter	10 x 16
Octavo Note.....	7 x 9	Commerc'l Letter	11 x 17
Commercial Note	8 x 10	Packet Post	11½ x 18
Packet Note	9 x 11	Foolscap	12½ x 16
Bath Note.....	8½ x 14		

F L A T.

Legal Cap.....	13 x 16	Medium.....	18 x 23
Flat Cap	14 x 17	Royal.....	19 x 24
Crown	15 x 19	Super Royal	20 x 28
D'ble Flat Letter	16 x 20	Imperial	22 x 30
Demy.....	16 x 24	Double Demy...	21 x 31
Folio Post.....	17 x 22	Elephant	22½ x 27½
Check Folio	17 x 24	Columbier.....	23 x 31½
Double Cap.....	17 x 28	Atlas	26 x 33
Extra Size Folio.	19 x 24	Double Elephant	26 x 40

NAILS.

The different sorts of nails are named either from the use to which they are applied, or from their shape, as shingle, floor, ship-carpenters' and horse-shoe nails; rose-heads, diamonds, &c. The term penny, when used to mark the size of nails, is supposed to be a corruption of pound. Thus a four-penny nail was such that one thousand of them weighed four pounds, ten-penny such that one thousand weighed ten pounds, &c.

RATES.

Although nails are sold at various prices, according to the size, quotations called *Rates* give one price only, meaning that all sizes from 10d to 60d inclusive, sell for the rate named. For prices on other sizes add extra to the price named, according to the following table.

EXTRAS.

2d Fine.....	\$4.00	6d Floor.....	\$1.25
2d	3.00	8d & 9d Floor.....	1.00
3d Fine.....	2.25	10d Floor, and larger.....	.75
3d	1.50		
4d Light	1.50	6d Brad Head.....	1.50
4d Swedes, com.	1.50	8d "	1.25
4d " bar	4.00	10d " and larger.....	1.00
4d & 5d } Common, .....	.75		
6d & 7d } Fence and .....	.50	3d Cooper & Slate....	2.00
8d & 9d } Sheathing. ....	.25	4d "	1.25
		5d "	1.25
Spikes.....	.25	6d "	1.00
		8d " .....	.75
3d Fine Box.....	4.00		
3d Box.....	3.00	Tin Roofing.....	3.00
4d "	2.00		
5d "	1.25	Steel Nails.....	1.00
6d & 7d Box	1.00		
8d & 9d " .....	.75	1 in. Clinch	4.00
10d Box, and larger. ....	.50	1 1/4 in. "	3.50
		1 1/2 in. "	3.00
4d Fine Finishing.	2.25	1 3/4 in. "	2.50
5d "	2.00	2 & 2 1/4 in Clinch.....	2.00
6d "	1.75	2 1/2 & 2 3/4 in. "	1.75
8d "	1.50	3 & 3 1/2 in. "	1.50
10d "	1.25	Half Casks, additional ....	.25
1 in. Barrel.....	2.50	Galvanizing..	2.50
1 1/2 in. "	2.00	Tinning.....	3.00

LENGTH OF NAILS.

2d	3d	4d	5d	6d	7d	8d	9d	10d	12d	20d	30d	40d	50d	60d
1 in.	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/2	4	4 1/2	5	5 1/2	6

NUMBER OF NAILS IN A POUND.

2d	4d	5d	6d	7d	8d	10d	12d	20d	30d	40d	50d
567	353	232	167	141	101	68	54	34	16	12	10

HOW TO MEASURE LAND.

Land can be measured with satisfactory accuracy for many purposes, by pacing. Five paces are equal to one lineal rod. A man having long legs usually measures more than a rod at five paces, while a short legged man will be obliged to step unnaturally long to measure a rod at five paces. The correct way is to measure $16\frac{1}{2}$ feet on level ground, then practice gauging the steps until one can measure one rod at every five steps, then one hundred steps or paces will be equal to twenty rods. If a plat of land be two hundred paces long and fifty paces wide, call every five paces a rod, multiply the rods in length by the rods in width, and divide the product by 160, the square rods in an acre. Thus: 100 paces = 20 rods, and 50 paces = 10 rods; $10 \times 20 = 200$ square rods, which, divided by 160, gives $1\frac{1}{4}$ acres.

A square acre is about 208 feet $8\frac{1}{2}$ inches on every side.

In order to lay out one acre of land four times as long as the width, the length must be 417 feet 5 inches, and the width 104 feet 4 inches.

Twenty feet front and 2,187 feet deep is one acre.

Twenty-five feet front and 1,742 $\frac{1}{4}$ feet deep is one acre.

Thirty-three feet front and 1,320 feet deep is one acre.

Forty feet front and 1,089 feet deep is one acre.

Fifty feet front and 876 $\frac{1}{2}$ feet deep is one acre.

One hundred feet front and 435 $\frac{1}{2}$ feet deep is one acre.

In one square acre there are 43,560 superficial feet.

TRANSACTIONS WITH BANKS.

Make your deposits in the bank as *early in the day as you conveniently can*, and never without your bank-book.

For your own security, it is well to have **ONE PARTICULAR PERSON** to do your business at the bank, who shall be competent to take charge of the money and papers you intrust to his care, and sufficiently intelligent to understand and properly deliver the messages and explanations you may have occasion to make ; also, that you write or stamp **OVER YOUR INDORSEMENT**, upon all checks which you send to be deposited to your credit in the bank, the words "**FOR DEPOSIT TO OUR CREDIT**," which will prevent their being used for any other purpose.

Always use the deposit tickets furnished by the bank, and examine the date and indorsement of every check. When checks are deposited the banks require them to be indorsed by the depositor, whether drawn to his order or not.

Keep your check-book, when not in use, under your own lock and key. Make it a rule to give checks only out of **YOUR OWN CHECK-BOOK**.

Draw as few checks as possible. When you have several sums to pay, draw **ONE CHECK** for the whole, and take notes of such denominations as will enable you to distribute the amount among those you intend it for.

Do not allow your bank-book to run too long without being balanced, and when returned by the bank compare it with your own account, and examine your cancelled checks without delay. If you wish to preserve your cancelled checks, deface or destroy the signature as soon as returned, in a manner that will

prevent their being copied, and place the checks out of the reach of others.

In filling up checks, do not leave space in which the amount may be increased. It has been decided that when a check is so carelessly drawn that an alteration may be easily made, the loss arising from the alteration, if any, must be borne by the drawer.

Write your signature with your usual freedom, and never vary the style of it.

Offer notes for discount or collection in good season. Do not put off the offering of notes for discount until the last day of your need. When notes are discounted or collected for you, hand your bank-book to the clerk, that they may be entered in it to your credit.

BROKERS' TECHNICALITIES.

A **BULL** is one who operates to depress the value of stocks, that he may buy for a rise.

A **BEAR** is one who sells stocks for future delivery, which he does not own at the time of sale.

A **CORNER** is when the Bears cannot buy or borrow the stock to deliver in fulfillment of their contracts.

OVERLOADED is when the Bulls cannot take and pay for the stock they have purchased.

SHORT is when a person or party sells stocks when they have none, and expect to buy or borrow in time to deliver.

LONG is when a person or party has a plentiful supply of stocks.

A **POOL** or **RING** is a combination formed to control the price of stocks.

A broker is said to **CARRY** stock for a customer when he has bought and is holding it for his account.

A **WASH** is a pretended sale by special agreement between buyer and seller, for the purpose of getting a quotation reported.

A **PUT AND CALL** is when a person gives so much per cent. for the option of buying or selling so much stock on a certain fixed day, at a price fixed the day the option is given.

MARKING GOODS.

In buying goods the merchant is often at a loss to know whether the price of the article suits his market or not; and if he is not a good accountant it often takes him some time to determine. Those who buy largely can best appreciate the value of a short method of calculating the percentage desired.

If you wish to calculate the per cent. on a single article, the following is considered the best method. If you wish to sell an article at any of the following per cents., say the article cost 70 cents, and you wish to make

10% Divide by 10, Multiply by 11=77.

20 " " 10, " 12=84.

25 " Multiply by 10, Divide " 8=87½.

30 " Divide by 10, Multiply " 13=91.

33½ Add ⅓ of itself. =93½.

33⅓% Divide by 3, Multiply by 4=93⅓.

50 " Add ½ of itself. =1.05.

Another method of marking 25 per cent. profit is to cut off the right-hand figure, and you have the price in shillings and pence: thus, if you buy an article for 60 cents, and wish to gain 25 per cent., cut off the right-hand figure and you have 6 shillings of $12\frac{1}{2}$ cents each, or 75 cents, the cost with 25 per cent added.

If the figure you cut off is not a cipher, add $\frac{1}{4}$, thus: 3 cents, add $\frac{3}{4}$; 5 cents, $1\frac{1}{4}$; 6 cents, $1\frac{1}{2}$, etc.

EXAMPLE.—Suppose an article cost 74 cents, and you wish to make it 25 per cent. advance, cut off the right-hand figure and you have 7 s. 4 d., $4 = \frac{1}{4} = 1$, added to 4 = 5, 7 s. = $87\frac{1}{2} + 5 = 92\frac{1}{2}$ cents.

How to mark an article bought by the dozen, to make 20 per cent.

Remove the decimal point one place to the left.

EXAMPLE.—Suppose a lot of hats cost \$2.50 per dozen, by removing the decimal point one place to the left we have 20 per cent. and cost, or .25 apiece for the hats. To ascertain any other per cent., we take the basis at 20 per cent. and add or subtract, as the case may be.

To make 25 per cent., remove the point one place to the left, and add $\frac{1}{4}$.

To make 30 % add $\frac{1}{3}$ itself.

"	33 $\frac{1}{3}$	"	"	$\frac{1}{3}$	"
"	35	"	"	$\frac{1}{5}$	"
"	38 $\frac{1}{2}$	"	"	$\frac{1}{3}$	"
"	40	"	"	$\frac{1}{5}$	"
"	44	"	"	$\frac{1}{5}$	"
"	50	"	"	$\frac{1}{2}$	"
"	60	"	"	$\frac{1}{3}$	"
"	80	"	"	$\frac{1}{2}$	"

These additions must be made after removing the point as above directed, and this sum will always be the selling price of a single article.

The above table contains all the per cents. generally used in business, and can easily be applied.

This rule is very valuable to the merchant in buying goods; suppose he buys his goods at auction, he does not have sufficient time to make extensive calculations before the goods are cried off. But by knowing that at 20 per cent. profit, he need not change a figure, he can tell instantly whether he can afford to buy those goods or not.

MARKING GOODS.

It is customary for merchants to have a private mark, denoting the cost and often the selling price. These marks are sometimes made up of peculiar characters, but mostly letters of the alphabet that represent the nine digits. For example :

BLACK HORSE

1 2 3 4 5 6 7 8 9 0

Suppose an article cost \$2.25, and you wish to sell it for \$5.00, the mark would be thus : $\frac{11k}{kce}$

Usually they have what is called a repeater, that is to be used where a letter is repeated, as above. suppose G to be the repeater; then instead of using the letters L and E twice, we insert the repeater, thus : $\frac{1k}{kcg}$. It sometimes happens that there are but two letters in the cost price and three in the selling price; to avoid this, place the letter representing 0 as the first letter in the cost, thus : write 75 cents cost. 1.00 selling price : $\frac{0ok}{beg}$.

HOW TO TELL

THE DAY OF THE WEEK,

THE DAY OF THE MONTH,

THE MONTH IN THE YEAR,

THE AGE IN YEARS,

WITHOUT ASKING A SINGLE QUESTION.

PROCESS.

Ask the person you wish to figure out the above facts for, to write down first, the day of the week on which he or she was born ; if this is not known, ascertain by preceding method ; next, the day of the month, next, the month in the year, then multiply the whole by 2, add 5, multiply by 50, add age, subtract 365, add 115, the result will be ; the first figure will be the day of the week ; the next, the day of the month ; the next the month in the year, and the last *the age in years.*

EXAMPLE.—I was born Wednesday, May 31, 1843.

PROCESS.—1st. Write 4 as the first figure, because Wednesday is the 4th day of the week.

2d Write 5 as the second figure, because May is the 5th month.

3d. Write 31 as the 3d and 4th figures, because this is the day on which I was born. The figures therefore read,

$$\begin{array}{r}
 4\ 5\ 3\ 1 \\
 \quad 2\ \text{multiply.} \\
 \hline
 9\ 0\ 6\ 2 \\
 \quad 5\ \text{add.} \\
 \hline
 9\ 0\ 6\ 7 \\
 \quad 5\ 0\ \text{multiply.} \\
 \hline
 4\ 5\ 3\ 3\ 5\ 0 \\
 \quad 4\ 1\ \text{add age.} \\
 \hline
 4\ 5\ 3\ 3\ 9\ 1 \\
 \quad 3\ 6\ 5\ \text{subtract.} \\
 \hline
 4\ 5\ 3\ 0\ 2\ 6 \\
 \quad 1\ 1\ 5\ \text{add.} \\
 \hline
 4, 5, 3\ 1. 4\ 1 \\
 \text{Day of the week.} \quad \text{Day of the month.} \quad \text{Age.}
 \end{array}$$

EXAMPLE 2d.—A friend was born April 6th.
Take number of month and day of month.

$$\begin{array}{r}
 5\ 6 \\
 \quad 2\ \text{multiply.} \\
 \hline
 1\ 1\ 2 \\
 \quad 5\ \text{added.} \\
 \hline
 1\ 1\ 7 \\
 \quad 5\ 0\ \text{multiply.} \\
 \hline
 5\ 8\ 5\ 0 \\
 \quad 5\ 0\ \text{add age.} \\
 \hline
 5\ 9\ 0\ 0 \\
 \quad 3\ 6\ 5\ \text{subtract.} \\
 \hline
 5\ 5\ 3\ 5 \\
 \quad 1\ 1\ 5\ \text{add.} \\
 \hline
 5, 6, 5\ 0
 \end{array}$$

HOW TO TELL THE DAY OF THE WEEK.

A scientific method of telling immediately what day of the week any date transpired or will transpire, from the commencement of the Christian Era for the term of three thousand years.

MONTHLY TABLE.

The ratio to add for each month will be found in the following table :

Ratio of June is.....0	Ratio of October is.....8
Ratio of September is....1	Ratio of May is..... 4
Ratio of December is....1	Ratio of August is.....5
Ratio of April is.....2	Ratio of March is.....6
Ratio of July is .....2	Ratio of February is.....6
Ratio of January is.....3	Ratio of November is....6

NOTE.—On Leap Year the Ratio of January is 2, and the ratio of February is 5. The ratio of the other ten months do not change on Leap Years.

CENTENNIAL TABLE.

The ratio to add for each century will be found in the following table :

Christian Era	200, 900, 1800, 2200, 2600, 3000, ratio is. ....0
	300, 1000, ratio is. ....6
	400, 1100, 1900, 2300, 2700, ratio is. ....5
	500, 1200, 1600, 2000, 2400, 2800 ratio is. ....4
	600, 1300, ratio is. ....3
	000, 700, 1400, 1700 2100 2500 2900 ratio is. ....2
	100, 800, 1500, ratio is. ....1

NOTE.—The figure opposite each century is its ratio; thus the ratio for 200, 900, etc., is 0. To find the ratio of any century, first find the century in the above table then run the eye along the line until you arrive at the end; the *small figure* at the end is its ratio.

METHOD OF OPERATION.

RULE.*—To the given year add its fourth part, rejecting the fractions; to this sum add the day of the month; then add the ratio of the month and the ratio of the century. Divide this sum by 7; the remainder is the day of the week, counting Sunday as the first, Monday as the second, Tuesday as the third, Wednesday as the fourth, Thursday as the fifth, Friday as the sixth, Saturday as the seventh; the remainder for Saturday will be 0 or zero.

EXAMPLE 1.—Required the day of the week for the 4th of July, 1810.

To the given year, which is.....10
 Add its fourth part, rejecting fractions..... 2
 Now add the day of the month, which is..... 4
 Now add the ratio of July, which is..... 2
 Now add the ratio of 1800, which is..... 0

Divide the whole sum by 7.

$$\begin{array}{r} 7 \overline{) 18-4} \\ \underline{2} \end{array}$$

We have 4 for a remainder which signifies the fourth day of the week, or Wednesday.

NOTE.—In finding the day of the week for the present century, no attention need be paid to the *centennial ratio*, as it is 0.

EXAMPLE 2.—Required the day of the week for the 2d of June, 1805.

To the given year, which is..... 5
 Add its fourth part, rejecting fractions..... 1
 Now add the day of the month, which is..... 2
 Now add the ratio of June, which is..... 0

Divide the whole sum by 7.

$$\begin{array}{r} 7 \overline{) 8-1} \\ \underline{1} \end{array}$$

We have 1 for a remainder, which signifies the first day of the week, or Sunday.

The Declaration of American Independence was signed July 4, 1776. Required the day of the week.

* When dividing the year by 4, always leave off the centuries. We divide by 4 to find the number of Leap Years.

To the given year, which is.....76

Add its fourth part, rejecting fractions.... 19

Now add the day of the month, which is 4

Now add the ratio of July, which is..... 2

Now add the ratio of 1700, which is..... 2

Divide the whole sum by 7,

$$\begin{array}{r} 7 \overline{) 103} - 5 \\ 14 \end{array}$$

We have 5 for a remainder, which signifies the fifth day of the week, or Thursday.

The Pilgrim Fathers landed on Plymouth Rock Dec. 20, 1620. Required the day of the week.

To the given year, which is.....20

Add its fourth part, rejecting fractions 5

Now add the day of the month, which is.....20

Now add the ratio of December, which is 1

Now add the ratio of 1600, which is..... 4

Divide the whole by 7,

$$\begin{array}{r} 7 \overline{) 50} - 1 \\ 7 \end{array}$$

We have 1 for a remainder, which signifies the first day of the week, or Sunday.

AMUSING ARITHMETIC.

Under the head of Amusing Arithmetic we give a collection of problems particularly adapted to the social circle, or the fireside, of a winter evening. The most of those problems are in the form of puzzles, and some of them particularly amusing. The majority of them are very old, their parentage being entirely unknown, so that no credit can be given to their authors. This is believed to be the largest collection ever published.

1. Think of a number of 3 or more figures, divide by 9, and name the remainder ; erase one figure of the number, divide by 9, and tell me the remainder, and I will tell you what figure you erased.

METHOD.—If the second remainder is less than the first, the figure erased is the difference between the remainders ; but if the second remainder is greater than the first, the figure erased equals 9, minus the difference of the remainders.

2. Think of a number, multiply it by 3, and multiply it also by 4, take the sum of the squares of the products, extract the square root of this sum, divide by the first number, and I will name the quotient.

METHOD.—The quotient will always be 5. The same will be also true if we have them multiply and divide by the same multiples of 3, 4, and 5, as 6, 8, 10, &c. If we have them divide by 5, it will give the number they commenced with.

3. Think of a number, multiply it by 5, also by 12 ; square each product, take their sum, extract the square root, divide by the number commenced with, and I will name the quotient.

METHOD.—The quotient is always 13. To give variety it is well to use multiples of 5, 12 ; as 10, 24, &c., and then the quotient is 26, &c.

4. Think of a number composed of two unequal digits, invert the digits, take the difference between this and the original number, name one of the digits and I will name the other.

METHOD.—The sum of the digits in the difference is always 9; hence when one is named, the other equals 9 minus the one named.

5. Take any number consisting of three consecutive digits and permute them, making 6 numbers, and take the sum of these numbers, divide by 6, and tell me the result, and I will tell you the digits of the number taken.

METHOD.—The quotient consists of three equal digits; the digits of the number taken are, 1st, one of these equal digits; 2d, this digit increased by a unit; 3d, this digit diminished by a unit. The same principle holds when the digits of the number taken differ by 2, 3, or 4. It is a very pretty problem to prove that the sum is always divisible by 9, and 18.

6. Think of a number greater than 3, multiply it by 3; if *even*, divide it by 2; if *odd*, add 1, and then divide by two. Multiply the quotient by 3; if *even*, divide by 2; if *odd*, add 1, and then divide by 2. Now divide by 9 and tell the quotient, without the remainder, and I will tell you the number thought of.

METHOD. — If *even* both times, multiply the quotient by 4; if *even* 2d, and *odd* 1st, multiply by 4, and add 1; if *even* 1st, and *odd* 2d, multiply by 4, and add 2; if *odd* both times, multiply by 4, and add 3.

7. Take any number, divide it by 9 and name the remainder. Multiply the number by some number which I name, and divide this product by 9, and I will name the remainder.

METHOD.—To tell the remainder, I multiply the first remainder by the number by which I told them to multiply the given number, and divide this product by 9. The remainder is the second number that they obtained.

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8. A and B have an 8 gallon cask full of wine, which they wish to divide into two equal parts, and the only measures they have are a 5 gallon cask and a 3 gallon cask. How shall they make the division with these two vessels?

METHOD.—Fill the 3 and pour it into the 5, then fill it again, and from it fill up the 5, which will leave one gallon in the 3 gallon keg; empty the 5 in to the 8, and pour the one from the 3 into the 5; fill the 3 again and empty into the 5; then there are four gallons in the 5 gallon keg, and the same left in the 8.

9. Two men have 24 ounces of fluid, which they wish to divide between them equally. How shall they effect the division, provided they have only three vessels, one containing 5 ozs., the other 11 ozs., and the third 13 ozs.

10. Two men, stopping at an oyster saloon, laid a wager as to which could eat the most oysters. One eat ninety-nine, and the other eat a hundred and won. How many did both eat?

REMARK.—The “catch” is in “a hundred and *won*.” When this is repeated it sounds as if it meant “one eat 99 and the other eat 101;” hence the result usually given is 200. The correct result, of course, is 199.

11. Six ears of corn are in a hollow stump. How long will it take a squirrel to carry them all out, if he takes out three ears a day?

REMARK.—The “catch” is in the word *ears*. He carries out two ears on his head, and one ear of corn each day; hence it will take him 6 days.

12. A and B went to market with 30 pigs each. A sold his at 2 for \$1, and B at the rate of 3 for \$1, and they, together, received \$25. The next day A went to market alone with sixty pigs, and, wishing

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to sell at the same rate, sold them at 5 for \$2, and received only \$24. Why should he not receive as much as when B owned half of the pigs?

METHOD.—The insinuation that the first lot were sold at the rate of 5 for \$2, being only true in part. They commence selling at that rate, but after making 10 sales, A's pigs are exhausted, and they have received \$20.; B still has 10, which he sells at "2 for a dollar," and of course receives \$5; whereas, had he sold them at the rate of 5 for \$2, he would have received but \$4.

13. In the bottom of a well, 45 feet deep, there was a frog which commenced travelling towards the top. In his journey he ascended 3 feet every day, but fell back two feet every night. In how many days did he get out of the well?

14. A man having a fox, a goose, and some corn, came to a river which it was necessary to cross. He could, however, take only *one* across at a time, and if he left the goose and corn, while he took the fox over, the goose would eat the corn; but if he left the fox and goose, the fox would kill the goose. How shall he get them all safely over?

METHOD.—Let him first take over the goose, leaving the fox and the corn, then let him take over the fox, and bring back the goose, then take over the corn, and lastly, take over the goose again.

15. A man went to a store and purchased a pair of boots worth \$5, and hands out a \$50 bill to pay for them; the merchant, not being able to make the change, passes over the street to a broker and gets the bill changed, and then returns and gives the man who bought the boots his change. After the purchaser of the boots has been gone a few hours, the broker, finding the bill to be a counterfeit, returns and demands \$50 of good money from the

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merchant. How much did the merchant lose by the operation.

REMARK.—At first glance some say \$45 and the boots; some, \$50 and the boots; some, \$95 and the boots; and others, \$100 and the boots. Which is correct?

16. What relation to me is my mother's brother-in-law's brother, provided he has but one brother?

17. Three men, travelling with their wives, came to a river which they wished to cross. There was but one boat, and but two could cross at one time; and, since the husbands were jealous, no woman could be with a man unless her own husband was present. In what manner did they get across the river.

METHOD.—Let A and wife go over, let A return, let B's and C's wives go over, A's wife returns, B and C go over, B and wife return, A and B go over, C's wife returns, and A's and B's wives go over, then C comes back for his wife.

Simple as this question may appear, it is found in the works of Alcuin who flourished a thousand years ago; hundreds of years before the art of printing was invented.
—*Parke.*

18. Suppose it were possible for a man, in Cincinnati, to start on Sunday noon, when the sun is in the meridian, and travel westward with the sun, so that it might be in his meridian all the time. He would arrive at Cincinnati next day at noon. Now, it was Sunday noon when he started, it has been noon with him all the way around, and is Monday noon when he returns. The question is at what point did it change from Sunday noon to Monday noon?

19. Suppose a hare is 10 rods before a hound, and that the hound runs 10 rods while the hare runs 1 rod. Now when the hound has run the 10 rods, the hare has run 1 rod; hence they are now one rod apart, and when the hound has run that 1 rod, the

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hare has run $\frac{1}{10}$ of a rod ; hence they are now $\frac{1}{10}$ of a rod apart, and when the hound has run the $\frac{1}{10}$ of a rod they are $\frac{1}{100}$ of a rod apart ; and in the same way it may be shown the hare is always $\frac{1}{10}$ of the previous distance ahead of the hound ; hence the hound can never catch the hare. How is the contrary shown mathematically.

20. Think of any three numbers less than 10. Multiply the first by 2, and add 5 to the product. Multiply this sum by 5, and add the second number to the product. Multiply this last result by 10, and add the third number to the product ; then subtract 250. Name the remainder, and I will name the numbers thought of, and in the order in which they were thought of.

METHOD.—The three digits composing this remainder will be the numbers thought of ; and the order in which they were thought of will be the order of hundreds, tens, and units.

21. Write 24 with three equal figures, neither of them being 8.

METHOD.— $22 + 2 = 24$, or $3^2 - 3 = 24$.

22. Put down four marks, and then require a person to put down five more marks, and make ten.

METHOD.—The four marks are as represented in the margin ; the five more, making ten, are placed as in the margin.

||||
T E N

23. Which is the greater, and how much, six dozen dozen, or one-half a dozen dozen, or is there no difference between them ?

24. Show what is wrong in the following reasoning:— $8 - 8$ equals $2 - 2$; dividing both these equals by $2 - 2$ and the result must be equal ; $8 - 8$ divided by $2 - 2 = 4$, and $2 - 2$ divided by $2 - 2$

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$= 1$; therefore, since the quotients of equals divided by equals, must be equal, 4 must be equal to 1.

25. A man has a triangular lot of land, the largest side being 136 rods, and each of the other sides 68 rods; required the value of the grass on it, at the rate of \$10 an acre.

REMARK.—The “catch” in this is, that the sides given will form no triangle.

26. Says A to B, “Give me four weights, and I can weigh any number of pounds not exceeding 40.” Required the weights and method of weighing.

ANSWER.—The weights are 1, 3, 9, and 27 pounds. In weighing, we must put one or more in both scales, or some in one scale and some in the other; thus, 7 lbs. $=$ 9 lbs. + 1 lb. $-$ 3 lbs.

27. Mr. Frantz planted 18 trees in his garden, in such a manner that there were 12 rows. and only 3 trees in each row. In what manner were they planted?

ANSWER.—They were in the form of a regular hexagon, having a tree in the centre, and one at the middle and extremity of each side.

28. A and B raised 749 bushels of potatoes on shares; A was to have $\frac{3}{7}$, and B $\frac{4}{7}$ of them. Before they were divided, however, since A had used 49 bushels, B took 28 bushels from the heap, and then divided the remainder according to the above agreement. Was this division fair? if not, show how it should have been.

29. Two-thirds of six is nine, one-half of twelve is seven,

The half of five is four, and six is half of eleven.

SOLUTION.—Two thirds of SIX is IX; the upper half of XII is VI; the half of FIVE is IV; and the upper half of XI is VI.

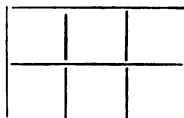
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30. Does the top of a carriage wheel move faster than the bottom?

METHOD.—This seems absurd, but it is strictly true, as any one may satisfy himself in a moment, by setting up a stake by the side of a wheel, and move the wheel forward a few inches.

31. Supposing there are more persons in the world than anyone has hairs on his head, there must be, at least, two persons who have the same number of hairs on the head, to a hair. Show how this is.

32. Place 17 little sticks — matches, for instance — making 6 equal squares, as in the margin. Then remove 5 sticks, and leave 3 perfect squares of the same size.



33. Three persons own 51 quarts of rice, and have only two measures; one a 4 quart and the other a 7 quart measure. How shall they divide it into three equal parts?

METHOD.—Perhaps the easiest way is to give each one 17 quarts, which may be obtained thus: fill the 7 quart measure, empty this into the 4 quart measure, and there will be 3 quarts in the 7 quart measure, which added to two 7 quart measures, equals 17 quarts.

34. What four United States coins will amount to fifty-one cents?

ANSWER.—Two 25 ct. pieces and two half-cents.

35. How may the nine digits be arranged in a rectangular form, so that the sum of any row, whether horizontal, vertical, or diagonal, shall equal 15?

4	9	2
3	5	7
8	1	6

ANSWER.—As in the margin.

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36. How may the first 16 digits be arranged, so that the sum of the vertical, and horizontal, and the two oblique rows, may equal 34?

ANSWER.—As in the margin.

1	16	11	6
13	4	7	10
8	9	14	3
12	5	2	15

37. In what manner may the first 25 digits be arranged, so that the sum of each row of five figures may be 65?

ANSWER.—As in the margin.

1	10	12	18	24
9	11	20	22	3
13	19	21	5	7
17	23	4	6	15
25	2	8	14	16

REMARK.—The above are called Magic Squares. They are very interesting, and have engaged the attention of some of our greatest mathematicians, among whom we may mention Leibnitz, Stifels. &c. The methods of arrangement given above are by no means the only ones that may be used. For the second problem, Frenicle, a French mathematician, has shown that there may be 878 different arrangements.

38. Take 10 pieces of money, lay them in a row, and require some one to put them together in heaps 2 in each, by passing each piece over 2 others.

METHOD.—Let the pieces be represented by the numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. Place 7 on 10, 5 on 2, 3 on 8, 1 on 4, and 9 on 6.

39. An old Jew took a diamond cross to a jeweller, to have the diamonds reset; and fearing that the jeweller might be dishonest, he counted the diamonds, and found that they numbered 7, in three different ways. Now the jeweller stole two diamonds, but arranged the remainder so that they counted 7 each way, as before. How was it done?

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METHOD.—The form of the cross when left is represented by Fig. 1, and when returned by Fig. 2. It will be seen by the figures how the diamonds were counted by the old Jew, and how they were arranged by the jeweller, who “jewed” the Jew.

No. 1.	No. 2.
7	7
6	7
76567	767
4	4
3	3
2	2
1	1

40. Let a person select a number greater than 1 and not exceeding 10 ; I will add to it a number not exceeding 10, alternately with himself ; and, although he has the advantage in selecting the number to start with, I will reach the even hundred first.

METHOD.—I make my additions so that the sums are, respectively. 12, 23, 34, 45, &c., to 89, when it is evident I can reach the hundred first. With one who does not mistrust the method, I need not run through the entire series, but merely aim for 89, or, when the secret of this is seen, for 78, then 67, &c.

41. Let a person think of any number on the dial-face of a watch ; I will then point to various numbers, and at each he will silently add *one* to the number selected until he arrives at *twenty*, which he will announce aloud, and my pointer will be upon the number he selected

METHOD.—I point promiscuously about the face of the watch until the eighth point, which should be upon “12;” and then pass regularly around, towards “1,” pointing at “11,” “10,” “9,” &c., until “twenty” is called, when, as may be easily shown, my pointer will be over the number selected.

42. Is there any difference between the results of the two following problems, and if so, what is it? If the half of 6 be 3, what will the fourth of 20 be? If 3 be the half of 6, what will be the fourth of 20?

43. A vessel with a crew of 30 men, half of whom were black, became short of provisions ; and, fearing that unless half the crew were thrown overboard, all would perish, the captain proposed to the sailors to

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stand upon deck in a row, and every ninth man be thrown overboard, until half the crew were destroyed. It so happened that the whites were saved. Required the order of arrangement.

ANSWER.—W W. W. W. B. B. B. B. B. W. W. B. W.
W. W. B. W. B. B. W. W. B. B. B. W. B. B. W. W. B.

This can easily be found by trial, using letters or figures to represent the men.

44. Think of a number, multiply it by 6, divide this product by 2, multiply by 4, divide by 3, add 40, divide by 4, subtract the number thought of, divide by 2, and the quotient is 5. Show why this is so.

45. If through passenger trains, running to and from Philadelphia and San Francisco daily, start at the same hour from each place (difference of longitude not being considered) and take the same time, six days, for the trip, how many through trains will the Pacific Express that leaves the San Francisco depot at 9 P. M., Sunday, have met when it reaches the Philadelphia depot?

46. A switch siding to a single track railroad is just long enough to clear a train of eight cars and a locomotive. How can two trains of sixteen cars and a locomotive each, going in opposite directions, pass each other at this siding, and each locomotive remain with and have the same relative position to its own train after as before passing?

47. Two hunters killed a deer, and sold it by the pound in the woods. They had no proper means of weighing it, but knowing their own weights—one 130 pounds and the other 190 pounds they placed a rail across a fence so that it balanced with one on each end. They then exchanged places, and the lighter man taking the deer in his lap, the rail again balanced. What was the weight of the deer?

VARIATIONS.

The doctrine of variations and combinations forms the basis of many forms of Lotteries, and of other calculations used in practical life. We shall commence with the simplest form of variations in which all the articles are taken at once and which is called

PERMUTATION.

To determine the number of permutations, commence with unity and multiply by the successive terms of the natural series 1, 2, 3, &c., until the highest multiplier shall express the number of individual things. The last product will indicate the number of possible changes.

Example 1. How many changes can be made in the arrangement of 5 grains of corn, all of different colors, laid in a row?

SOLUTION.— $1 \times 2 \times 3 \times 4 \times 5 = 120$, *Aus.*

This may seem improbable, the number being so great, but if there were but a single grain more, the possible changes would be 720; and another would extend the limit to 5040; and so onward in a constantly increasing ratio. The reason, however, will be obvious on a little scrutiny. If there were but one thing, as *a*, it would admit of but one position; but if two, as *a b*, it would admit of two positions, *ab*, *ba*. If three things, as *a b c*, then they will admit of $1 \times 2 \times 3 = 6$ changes, for the last two will admit of two variations, as *a b c*, *a c b*, and each of the three may successively be placed first, and two changes made to each of the others, so that $3 \times 2 = 6$, the number of possible changes. In the same way we may show that if there be four individual things, each one will be first in each of the six changes which the other three will undergo, and consequently, there will be 24 changes in all. In this way we might show that when there are 5 individual things, there will be 5 times as many changes as, when there were but 4; and when 6, there will be 6 times as

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many changes as when there are only 5; and so on *ad infinitum*, according to the same law.

Example 2. In how many ways may a family of 10 persons seat themselves differently at dinner?

ANSWER.—3628800.

When we consider that this would require a period of $9935\frac{55}{487}$ years, the mind is lost in astonishment. The story of the man who bought a horse at a farthing for the first nail in his shoe, a penny for the second, &c., is thrown into the shade; and we incline to doubt whether there is not some mistake; and yet on just such chances as one to all these do gamblers constantly risk their money!

Example 3. I have written the letters contained in the word NIMROD on 6 cards, being one letter on each, and having thrown them confusedly into a hat, I am offered \$10 to draw the cards successively, so as to spell the name correctly. What is my chance of success worth?

ANSWER.— $1\frac{7}{18}$ cents.

48. Sold a horse for \$56, and gained as much per cent. as the horse cost me. Required the cost.

RULE.—“Multiply the selling price by 100, and add 2500 to the product; of the sum extract the square root, and from the root subtract 50. The remainder will be the prime cost.”

Horse sold for \$56	Proof—
100	Cost \$40
—	Per cent. 40
5600	—
+2500	Gain 16.00
—	Cost 40
$\sqrt{8100}=90$	—
—50	Sold for \$56
—	—
Leaves \$40 cost.	

Human ingenuity would perhaps fail to find a reason for the above rule, by the aid of common arithmetic merely, or to explain the steps satisfactorily to a learner. It seems to be without reason, and yet it will solve all questions involving a similar principle.

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49. Suppose 2000 soldiers had been supplied with bread sufficient to last them 12 weeks, allowing each man 14 ozs. per day; but on examination they find 105 barrels, containing 200 lbs. each, wholly spoiled; what must be the allowance to each man, that the remainder may last them the contemplated time?

ANALYSIS, as follows:—1st. If one man ate 14 ozs. in a day, he would eat 7 times 14=98 ozs. in a week; and if he ate 98 ozs. in a week, he would eat $12 \times 98 = 1176$ ozs. in 12 weeks; and 2000 men would eat 2000×1176 ozs. = 2352000 ozs. in 12 weeks.

105 barrels of 200 lbs. each = 21000 lbs. destroyed; and $21000 \times 16 = 336000$ ozs., which deducted from the whole quantity 2352000 ozs. leaves 2016000 ozs. to be consumed. Then if 2000 men consume 2016000 ozs. in 12 weeks, 1 man will consume $\frac{2016000}{2000} = 1008$, ozs.; and if 1 man consume 1008 ozs. in 12 weeks, he will consume $\frac{1008}{12} = 84$ ozs. in 1 week, and $\frac{84}{7} = 12$ ozs. in 1 day. *Ans.*

50. How may 100 be expressed with four nines?

ANSWER. — $99\frac{9}{9}$.

51. What three figures, multiplied by 4, will make precisely 5?

ANSWER. — $1\frac{1}{4}$, or 1.25.

52. Required to subtract 45 from 45 and leave 45 as a remainder.

$$\begin{array}{r} \text{SOLUTION. — } 9+8+7+6+5+4+3+2+1=45 \\ 1+2+3+4+5+6+7+8+9=45 \\ \hline 8+6+4+1+9+7+5+3+2=45 \end{array}$$

53. From 6 take 9; from 9 take 10;

From 40 take 50, and 6 will remain!

SOLUTION.—

SIX	IX	XL
IX	X	L
S	I	X

The majority of these puzzles and problems being founded upon principles quite easily comprehended, it is not thought necessary to explain the principles of the puzzles nor solve the problems. It is hoped that they may prove a source of pleasure and profit.

HISTORICAL FACTS

**connected with the formation of the original Union,
and the admission of new States.**

On Monday, September 5, 1774, a number of men were assembled at Carpenter's Hall, Philadelphia, who had been chosen by the several Colonies, in what now constitutes the United States, to hold a Congress for the purpose of discussing certain grievances imputed to the mother country. This Congress resolved that each colony should have one vote only. On Tuesday, July 2, 1776, the Congress resolved, "That these United Colonies are and of right ought to be Free and Independent States," etc. ; and on Thursday, July 4, the whole Declaration of Independence having been agreed upon, was publicly read to the people. On September 9 it was resolved that the words "United Colonies" should no longer be used, and that "United States" should thenceforward be the style and title of the Union. On Saturday, November 15, 1777, "Articles of Confederation and Perpetual Union of the United States of America" were agreed to by the State Delegates, subject to the ratification of the several State Legislatures. Eight of the States ratified these articles July 9, 1778 ; one July 21 ; one July 24 ; one November 26 ; one February 22, 1779 ; and the last one March 1, 1781.

Cost of the Wars of the United States.

The Revolutionary war cost the United States \$135,193,703. The Colonies furnished, from 1775 to 1783, 395,064 troops.

The war of 1812 cost the United States \$107,159,003. The number of troops engaged is estimated at 471,622.

The Mexican war cost the United States \$100,000,000. The number of troops engaged was 101,282.

The war of the Rebellion cost the United States \$6,189,929,900. The number of Federal troops was 2,859,132.

GOVERNMENT OF THE UNITED STATES.

The executive power is vested in the President, who holds office for four years, and receives \$50,000 annually.

The President and Vice-President are elected by electors chosen by the people. The number of electors from each State is equal to the whole number of Senators and Representatives to which the State may be entitled.

The Electors vote by ballot. These votes are sent sealed to the President of the Senate, who opens them in the presence of Congress. If there are two parties who have received an equal number of votes, the house of representatives choose by ballot one of them for President.

The various Cabinet officers are appointed by the President. They are six in number, and receive \$8,000 annually.

The legislative power is vested in Congress, of which there are two branches: the Senate, which is composed of two members from each State, who hold office for six years, at an annual salary of \$5,000; and the House of Representatives, who are elected by the vote of each State, to hold office two years, and receive \$5,000 annually.

As President of the Senate, the Vice-President performs his entire duty, except in case of removal or death of the President, in which event he assumes the executive powers. He is elected for the same term of office as the President, and receives \$10,000 annually.

The President of the United States is commander-in-chief of the army and navy; but the direct supervision of them belongs to the Secretaries of War and of the Navy.

The judiciary of the United States consists of a Supreme Court, which sits at Washington, and which is composed of a Chief Justice, who receives \$10,500 annually, and eight Associate Justices, who receive \$10,000 annually. They are appointed by the President, and hold office during good behavior.

The United States is divided into nine judicial circuits, each of which has a circuit judge, who is paid \$6,000 a year.

There are also fifty-eight district courts, from which an appeal lies to the circuit court.

Each State and Territory has its own local government, not unlike the general government in its essential features. The executive authority is vested in the Governor, whose term of office and salary vary in different States.

The revenue of the government is chiefly derived from customs duties, proceeds of sales of public lands, and internal revenue taxes upon distilled spirits, fermented liquors, tobacco, etc. The principal source of revenue has been the customs duties. Since the year 1865-66 the revenue has each year largely exceeded the expenditure, and there has been a gradual reduction of taxes. In conformity with several enactments of Congress, the surplus revenue is devoted to the gradual redemption of the public debt.

Presidents of the Continental Congress

Peyton Randolph, Virginia, September 5, 1774.
 Henry Middleton, South Carolina, October 22, 1774.
 Peyton Randolph, Virginia, May 10, 1775.
 John Hancock, Massachusetts, May 24, 1775.
 Henry Laurens, South Carolina, November 1, 1777.
 John Jay, New York, December 10, 1778.
 Samuel Huntington, Connecticut, September 28, 1779.
 Thomas McKean, Delaware, July 10 1781.
 John Hanson, Maryland, November 5, 1781.
 Elias Boudinot, New Jersey, November 4, 1782.
 Thomas Mifflin, Pennsylvania, November 3, 1783.
 Richard Henry Lee, Virginia, November 30, 1786.
 Nathaniel Gorham, Massachusetts, June 6, 1786.
 Arthur St Clair, Pennsylvania, February 2, 1787.
 Cyrus Griffin, Virginia, January 22, 1788.

The seat of government was established, first at Philadelphia, Penn., commencing September 5, 1774, and May 10, 1775; at Baltimore, Md., December 20, 1776; at Philadelphia, Penn., March 4, 1777; at Lancaster, Penn., September 27, 1777; at York, Penn., September 30, 1777; at Philadelphia, Penn., July 2, 1778; at Princeton, N. J., June 30, 1783; at Annapolis, Md., November 26, 1783; at Trenton, N. J., November 1, 1784; and at New York City, January 11, 1785.

On the 4th of March, 1789, the present Constitution, which had been adopted by a convention and ratified by the requisite number of States, went into operation. The several State Legislatures ratified this instrument at the following dates:

Delaware, December 7, 1787; Pennsylvania, December 12, 1787; New Jersey, December 13, 1787; Georgia, January 2, 1788; Connecticut, January 9, 1788; Massachusetts, February 6, 1788; Maryland, April 28, 1788; South Carolina, May 23, 1788; New Hampshire, June 21, 1788; Virginia, June 26, 1788; New York, July 26, 1788; North Carolina, November 21, 1789; Rhode Island, May 29, 1790.

The privilege of becoming members of the Union by ratifying the Constitution was confined to those States that were parties to the confederation by which the Constitution had been framed. The Constitution was adopted by the Convention, September 17, 1787. It required that nine States should ratify it before its provisions could go into effect. Congress, on the 13th of September, 1788, determined that as a sufficient number of States had ratified it—eleven having done so—it should become operative on the first Wednesday (the 4th) of March, 1789. North Carolina and Rhode Island had not yet sanctioned it; but as soon as they acceded to its provisions, they were admitted to its privileges.

PRESIDENTS OF THE UNITED STATES.

WHERE BORN.	DATE OF BIRTH.	TERM OF OFFICE.	AGE WHEN TERM EXPIRED.	DIED.
George Washington, <i>Fed.</i>	February 22,	1732,	1789 to 1797.	66. December 14, 1799.
John Adams, <i>Fed.</i>	October 19,	1735,	1797 to 1801.	66. July 4, 1826.
Thomas Jefferson, <i>Repub.</i>	April 2,	1743,	1801 to 1809.	66. July 4, 1826.
James Madison, <i>Repub.</i>	March 16,	1751,	1809 to 1817.	66. June 28, 1836.
James Monroe, <i>Repub.</i>	April 28,	1758,	1817 to 1825.	66. July 4, 1831.
John Q. Adams, <i>Repub.</i>	July 11,	1767,	1825 to 1829.	62. February 23, 1848.
Andrew Jackson, <i>Dem.</i>	March 15,	1767,	1829 to 1837.	70. June 8, 1845.
Martin Van Buren, <i>Dem.</i>	December 5,	1782,	1837 to 1841.	59. July 24, 1862.
William H. Harrison, <i>Whig</i>	February 9,	1773,	1841 to 1845.	69. April 4, 1841.
John Tyler, <i>Dem.</i>	March 20,	1790,	1841 to 1845.	55. January 17, 1862.
James K. Polk, <i>Dem.</i>	November 2,	1795,	1845 to 1849.	54. June 15, 1849.
Zachary Taylor, <i>Whig</i>	November 24,	1784,	1849 to 1850.	65. July 9, 1850.
Millard Fillmore, <i>Whig</i>	January 7,	1800,	1850 to 1853.	53. March 10, 1874.
Franklin Pierce, <i>Dem.</i>	November 23,	1804,	1853 to 1857.	53. October 8, 1869.
James Buchanan, <i>Dem.</i>	April 13,	1791,	1857 to 1861.	69. June 1, 1868.
Abraham Lincoln, <i>Repub.</i>	February 12,	1809,	1861 to 1865.	56. April 15, 1865.
Andrew Johnson, <i>Dem.</i>	December 29,	1808,	1865 to 1869.	60. July 31, 1875.
Ulysses S. Grant, <i>Repub.</i>	April 27,	1822,	1869 to 1877.	54. July 23, 1885.
Rutherford B. Hayes, <i>Rep.</i>	October 4,	1822,	1877 to 1881.	58.
James A. Garfield, <i>Repub.</i>	November 19,	1831,	1881 to 1885.	49. September 19, 1881.
Chester A. Arthur, <i>Repub.</i>	October 5,	1830,	1881 to 1885.	54.
Grover Cleveland, <i>Dem.</i>			1885 to	

Vice Presidents and Term of Office.

John Adams. Mass., April 30, 1789, to March 4, 1797.
 Thomas Jefferson. Va., March 4, 1797, to March 4, 1801.
 Aaron Burr, N. Y., March 4, 1801, to March 4, 1805.
 George Clinton. N. Y. (died April 20, 1812), March 4, 1805, to March 4, 1813.
 Elbridge Gerry. Mass. (died November 23, 1814), March 4, 1813, to March 4, 1817.
 Daniel D. Tompkins, N. Y., March 4, 1817, to March 4, 1825.
 John C. Calhoun, S. C., March 4, 1825, to March 4, 1833.
 Martin Van Buren, N. Y., March 4, 1833, to March 4, 1837.
 Richard M. Johnson. Ky., March 4, 1837, to March 4, 1841.
 John Tyler, Va. (President after death of W. H. Harrison, April 4, 1841), March 4, 1841, to March 4, 1845.
 George M. Dallas. Penn., March 4, 1845, to March 4, 1849.
 Millard Fillmore. N. Y. (President after death of Z. Taylor, July 9, 1850), March 4, 1849, to March 4, 1853.
 William R. King. Ala. (died April 18, 1853), March 4, 1853, to March 4, 1857.
 J. C. Breckinridge. Ky., March 4, 1857, to March 4, 1861.
 Hannibal Hamlin, Me., March 4, 1861, to March 4, 1865.
 Andrew Johnson, Tenn. (President after the death of A. Lincoln, April 15, 1865), March 4, 1865, to March 4, 1869.
 Schuyler Colfax, Ind., March 4, 1869, to March 4, 1873.
 Henry Wilson, Mass., March 4, 1873 (died November 22, 1875).
 William A. Wheeler, N. Y., March 4, 1877, to March 4, 1881.
 Chester A. Arthur, N. Y., March 4, 1881, to September 19, 1881.
 David Davis, Illinois (acting) Dec. 1881, to March 3, 1883.
 George F. Edmunds, Vermont (acting), March 3, 1883.
 Thomas C. Hendricks, Ind., March 4, 1885, to

Twenty-five States have been admitted into the Union since the confederation of the original thirteen colonies, their admission taking effect as follows:

- | | |
|--------------------------------|---------------------------------|
| 1. Vermont, Mar. 4, 1791. | 14. Florida, March 3, 1845. |
| 2. Kentucky, June 1, 1792. | 15. Texas, Dec. 29, 1845. |
| 3. Tennessee, June 1, 1796. | 16. Iowa, December 28, 1846. |
| 4. Ohio, November 29, 1802. | 17. Wisconsin, May 29, 1848. |
| 5. Louisiana, April 30, 1812. | 18. California, Sept. 9, 1850. |
| 6. Indiana, Dec. 11, 1816. | 19. Minnesota, May 11, 1858. |
| 7. Mississippi, Dec. 10, 1817. | 20. Oregon, Feb. 14, 1859. |
| 8. Illinois, Dec. 8, 1818. | 21. Kansas, Jan. 29, 1861. |
| 9. Alabama, Dec. 14, 1819. | 22. W. Virginia, June 19, 1863. |
| 10. Maine, March 15, 1820. | 23. Nevada, Oct. 31, 1864. |
| 11. Missouri, Aug. 10, 1821. | 24. Nebraska, Mar. 1, 1867. |
| 12. Arkansas, June 15, 1836. | 25. Colorado, Aug. 1, 1876. |
| 13. Michigan, Jan. 26, 1837. | |

MINISTERS TO FOREIGN COUNTRIES.

ENVOYS EXTRAORDINARY AND MINISTERS PLENIPO- TENTIARY.

Austria-Hungary.....	Vienna.....	\$12,000
Brazil	Rio de Janerio...	12,000
Central American States..	Guatemala City...	10,000
Chili.....	Santiago	10,000
China	Pekin.....	12,000
France	Paris.....	17,500
Germany.....	Berlin	17,500
Great Britain.....	London.....	17,500
Italy.....	Rome.....	12,000
Japan.....	Yeddo.....	12,000
Mexico.....	Mexico.....	12,000
Peru.....	Lima.....	10,000
Russia	St. Petersburg....	17,500
Spain	Madrid.....	12,000
Turkey.....	Constantinople...	7,500

MINISTERS RESIDENT.

Argentine Republic.....	Buenos Ayres.....	\$7,500
Belgium	Brussels.....	7,500
Bolivia	LaPaz.....	5,000
Colombia.....	Bogota.....	7,500
Denmark	Copenhagen	5,000
Greece, Roumania and Servia.....	Athens.....	5,000
Hawaiian Islands.....	Honolulu.....	7,500
Hayti.....	Port-au-Prince....	5,000
Liberia.....	Monrovia.....	5,000
Paraguay and Uruguay..	Montevideo.....	5,000
Portugal.....	Lisbon	5,000
Siam	Bangkok.....	3,000
Sweden and Norway....	Stockholm.....	7,500
Switzerland.....	Berne.....	5,000
The Netherlands.....	The Hague.....	7,500
Venezuela.....	Caraccas	7,500

CABINET OFFICERS.

SECRETARIES OF STATE.

The "State Department" was created by Act of Congress, 1789.

Thomas Jefferson, Virginia, September 26, 1789; born 1743, d'ed 1826.

Edmund Randolph, Virginia, Jan. 2, 1794; b. . . ., d 1813.

Timothy Pickering, Mass. Dec. 10, 1795: b 1745, d 1829.

John Marshall, Virginia, May 13, 1800; b 1755, d 1835.

James Madison, Virginia, March 5, 1801: b 1751, d 1836.

Robert Smith, Maryland, March 6, 1809; b 1757, d 1842.

James Munroe, Virginia, Nov. 25, 1811: b 1758, d 1831.

John Quincy Adams, Mass., March 3, 1817; b 1767, d 1848.

Henry Clay, Kentucky, March 8, 1825; b 1777, d 1852.

Martin Van Buren, N. Y., March 6, 1829, b 1782; d 1862.

Edward Livingston, La., April or May, 1831; b 1764, d 1836.

Louis Mc Lane, Delaware, March 7, 1833; b 1786, d 1857.

John Forsyth, Georgia, June 27, 1834; b 1780, d 1841.

Daniel Webster, Mass., March 5, 1841; b 1782, d 1852.

Hugh S. Legare(acting), S. Carolina, May 9, 1843; b 1797.

Abel P. Upshur, Virginia, June 24, 1843: b 1790, d 1843.

John Nelson (acting), Maryland, Feb. 29, 1844; b. . . . d. .

John C. Calhoun, S. C., March 6, 1844; b 1782, d 1850.

James Buchanan, Penn., March 5, 1845; b 1791, d 1868.

John M. Clayton, Delaware, March 7, 1849; b 1796, d 1856.

Daniel Webster, Mass., July 20, 1850; b Franklin, N. H., 1782, d 1852.

Edward Everett, Mass., Nov. 1852; b 1794, d Jan. 15 1865.

William L. Marcy, N. Y., March 5, 1853; b 1786, d 1857.

Lewis Cass, Mich., Mar. 5, 1857; b Exeter, N. H., Oct. 9, 1782, d 1866.

Jeremiah S. Black, Penn., December 14, 1860: b 1810

William H. Seward, N. Y., Mar. 6, 1861; b 1801, d Oct 10, 1872.

Elihu B. Washburne, Illinois, March 4, 1869; b 1816.

Hamilton Fish, New York, March 17, 1869; b 1809.

William M. Evarts, New York, March 12, 1877; b 1818.

James G. Blaine, Maine, March 7, 1881; b 1830.

Frederick T. Frelinghuysen, N. J., Dec. 12, 1881; b 1817.

Thos. F. Bayard, Delaware,

SECRETARIES OF THE TREASURY.

The "Treasury Department" created by Act of Congress, 1789.

Alexander Hamilton, N. Y., Sept. 11, 1789; b 1757, d 1804.

Oliver Wolcott, Conn., February 3, 1795; b 1760, d 1833.

Samuel Dexter, Mass., Dec. 31, 1800; b 1761, d 1816.

Albert Gallatin, Penn., Jan. 26, 1802; b 1761, d 1849.

George W. Campbell, Tenn., Feb. 9, 1814; b 1768, d 1848.

Alexander J. Dallas, Penn., Oct. 6, 1814; b 1759, d 1817.

William H. Crawford, Ga., Mar. 5, 1817; b 1772, d 1834.

Richard Rush, Penn., March 7 1825; b 1780, d 1859

Samuel D. Ingham, Penn., Mar. 6, 1829; b 1779, d 1860.

Louis McLane, Del., April or May, 1831; b 1786, d 1857.
 William J. Duane, Penn., Jan. or June, 1833; b 1780, d 1865.
 Roger B. Taney (not confirmed by Senate), 1833; b 1777, d 1864.
 Levi Woodbury, N. H., June 21, 1834; b 1789, d 1851.
 Thomas Ewing, Ohio, March 5, 1841; b 1789, d 1871.
 Walter Forward, Penn., Sept. 13, 1841; b 1786, d 1852.
 John C. Spencer, N. Y., March 3, 1843; b 1788, d 1855.
 George M. Bibb, Kentucky, Jan. 15, 1844; b 1784, d 1859.
 Robert J. Walker, Miss., March 5, 1845; b 1801, d 1869.
 William M. Meredith, Penn., March 7, 1849; b 1799.
 Thomas Corwin, Ohio, July 20, 1850; b 1794, d 1865.
 James Guthrie, Kentucky, Mar. 5, 1853; b 1793, d 1869.
 Howell Cobb, Georgia, March 5, 1857; b 1815, d 1868.
 Philip F. Thomas, Maryland, Dec. 12, 1860; b 1810.
 John A. Dix, N. Y., Jan. 11, 1861; b Boscowen, N. H., 1798, d April 21, 1879.
 Salmon P. Chase, Ohio, Mar. 4, 1861; b Cornish, N. H., 1808, d May 7, 1873.
 Wm. Pitt Fessenden, Maine, July 1864; b Boscowen, N. H., 1806, d 1869.
 Hugh McCulloch, Indiana, March 4, 1865.
 George S. Boutwell, Mass., March 11, 1869; b 1818.
 William A. Richardson, Mass., March 17, 1873; b 1810.
 Benj. H. Bristow, Kentucky, June 4, 1874; b 1833.
 Lot M. Morrill, Maine, July 7, 1876; b May 3, 1815, d Jan. 10, 1883.
 John Sherman, Ohio, Mar. 8, 1877; b May 10, 1823.
 William Windom, Minnesota, March 7, 1881; b 1827.
 Charles J. Folger, New York, October 27, 1881.
 Daniel S. Manning, March, 1885.

SECRETARIES OF THE INTERIOR.

The "Department of the Interior" created by Act of Congress, 1849.

Thomas Ewing, Ohio, March 7, 1849; b 1789, d 1871.
 T. M. T. McKennan (declined), Penn., 1850; d 1852.
 Alexander H. H. Stuart, Virginia, Sept. 2, 1850; b 1807.
 Robert McClelland, Michigan, March, 1853; b 1807.
 Jacob Thompson, Mississippi, March 5, 1857; b 1810.
 Caleb B. Smith, Indiana, March 6, 1861; b 1808, d 1864.
 John P. Usher, Indiana, January 8, 1863.
 James Harlan, Iowa, May 15, 1865; b 1820.
 O. H. Browning, Illinois, Sept. 1, 1866; b 1810.
 Jacob B. Cox, Ohio, March 4, 1869; b 1828.
 Columbus Delano, Ohio, Nov. 1, 1870; b 1809.
 Zachariah Chandler, Michigan, Oct. 19, 1875; b . . . , d Nov. 1, 1879.
 Carl Schurz, Missouri, March 12, 1877; b Prussia, March 2, 1829.
 Samuel J. Kirkwood, Iowa, March 7, 1881; b 1818.
 Henry M. Teller, Colorado, April 17, 1882; b 1830.

SECRETARIES OF WAR.

"War Department," created by Act of Congress, Aug. 7, 1789.

Henry Knox, Massachusetts, Sept. 12, 1789; b 1750; d 1806.
Timothy Pickering, Massachusetts, Jan. 2, 1795; b 1745,
d 1829.

James McHenry, Maryland, Jan. 27, 1796; b 1755, d....

Samuel Dexter, Massachusetts, May 13, 1800; b 1761,
d 1816.

Roger Griswold, Connecticut, Feb. 3, 1801; b 1762, d 1812.

Henry Dearborn, Massachusetts, March 4, 1801; b 1751,
d 1829.

William Eustis, Massachusetts, March 7, 1809; b 1753,
d 1825.

James Armstrong, New York, Jan. 19, 1813; b 1758, d 1843.

James Monroe, Virginia, Sept. 26, 1814; b 1758, d 1831.

William H. Crawford, Georgia, March 2, 1815; b 1772,
d 1834.

George Graham (acting), Virginia, 1817; b 1758, d 1826.

John C. Calhoun, South Carolina, Oct. 16, 1817; b 1782,
d 1850.

James Barbour, Virginia, March 7, 1825; b 1755, d 1842.

Peter B. Porter, New York, May 26, 1828; b 1773, b 1844.

John A. Eaton, Tennessee, March 9, 1829; b 1790, d 1856.

Lewis Cass, Michigan, Aug 1, 1831; b Exeter, N. H., 1772,
d 1866.

Benjamin F. Butler (acting), New York, 1837; b 1795,
d 1858.

Joel R. Poinsett, South Carolina, March 7, 1837; b 1779,
d 1851.

John Bell, Tennessee, March 5, 1841; b 1797, d 1869.

John McLean, Ohio (declined), Sept. 13, 1841.

John C. Spencer, New York, Oct. 12, 1841; b 1788, d 1855.

James M. Porter, Pennsylvania, March 8, 1843.

William Wilkins, Pennsylvania, Feb. 15, 1844; b 1799,
d 1865.

William L. Marcy, New York, March 5, 1845; b 1786,

George W. Crawford, Georgia, March 7, 1849; b 1788.

Charles M. Conrad, Louisiana, Aug. 15, 1850; b 1804.

Jefferson Davis, Mississippi, March 5, 1853; b 1808.

John B. Floyd, Virginia, March 5, 1857; b 1805, d 1863.

Joseph Holt (acting from Dec. 29, 1860 to Jan. 16, 1861),
Kentucky; b 1807.

Simeon Cameron, Pennsylvania, March 6, 1861; b 1799.

Edwin N. Stanton, Pennsylvania, Jan. 12, 1862; b 1815,
d 1869.

Ulysses S. Grant, Illinois (*ad int.*), Aug, 12, 1867; b Ohio,
April 27, 1822.

L. Thomas (*ad int.*)

John M. Schofield, Illinois, May 30, 1868; b N. Y., 1831.

John A. Rawlins, Illinois, March 11, 1869; b 1831, d Sept.,
1869.

Alfonso Taft, Ohio, March 8, 1876.

James D. Cameron, May 22, 1876; b 1833.
 Geo. W. McCrary, Iowa, March 12, 1877; b Aug. 27, 1835.
 Alexander Ramsey, Minnesota, Dec. 10, 1879; b Sept. 8, 1815.
 Robert T. Lincoln, Illinois, March 15, 1881.
 William C. Endicott, Massachusetts, March, 1885.

SECRETARIES OF THE NAVY.

"Navy Department," created by Act of Congress, April 30, 1798

George Cabot (declined), Massachusetts, May 3, 1798; b 1751, d 1823.
 Benjamin Stoddert, Maryland, May 21, 1798.
 Robert Smith, Maryland, Jan. 26, 1801; b 1757, d 1842.
 Jacob Crowninshield, Massachusetts, March 2, 1805.
 Paul Hamilton, South Carolina, March 7, 1809; b...., d 1816.
 William Jones, Pennsylvania, Jan. 12, 1813; d 1831.
 B. W. Crowninshield, Massachusetts, Dec. 17, 1814; b 1774, d 1851.
 Smith Thompson, New York, Nov. 30, 1818; b 1767, d 1843.
 John Rogers (acting), — 1823; b 1765, d 1838.
 Samuel L. Southard, New Jersey, Dec. 9, 1823; b 1787, d 1842.
 John Branch, North Carolina, March 9, 1829; b 1782, d 1863.
 Levi Woodbury, New Hampshire, April, 1831; b 1789, d 1851.
 Mahlon Dickerson, New Jersey, June 30, 1834; b 1779, d 1853.
 James K. Paulding, New York, June 25, 1838; b 1779, d 1860.
 George E. Badger, North Carolina, March 5, 1841; b 1795, d 1866.
 Abel P. Upshur, Virginia, Sept. 13, 1841; b 1790, d 1844.
 David Henshaw, Massachusetts, July 24, 1843; b 1791, d 1852.
 Thomas W. Gilmer, Virginia, Feb. 15, 1844; b...., d 1844.
 John Y. Mason, Virginia, Sept. 9, 1846; b 1795, d 1859.
 George Bancroft, Massachusetts, March 10, 1845, b 1800.
 John Y. Mason, Virginia, March 14, 1844; b 1795, d 1859.
 William B. Preston, Virginia, March 7, 1849; d 1862.
 William A. Graham, North Carolina, July 20, 1850; b 1800.
 John P. Kennedy, Maryland, July 22, 1852; b 1795, d 1870.
 James C. Dobbin, North Carolina, March 5, 1853; b 1814, d 1857.
 Isaac Toucey, Connecticut, March 5, 1857; b 1798, d 1869.
 Gideon Welles, Connecticut, March 6, 1861; b 1802.
 Adolph E. Borie, Pennsylvania, March 4, 1869; b 1810, d 1882.
 George M. Robeson, New Jersey, June 25, 1869; b 1829.
 Richard W. Thompson, Indiana, March 12, 1877; b June 9, 1809.

Nathan Goff, Jr., West Virginia, Jan. 6, 1881.
 William H. Hunt, Louisiana, March 7, 1881.
 William E. Chandler, New Hampshire, April 1, 1882.
 William C. Whitney, New York, March 1885

POST-MASTERS-GENERAL.

The "Post-Office Department" was established by the old Congress.

Samuel Osgood, Massachusetts, Sept. 26, 1789; b 1748, d 1813
 Timothy Pickering, Massachusetts, August 1791; b 1745, d 1829.
 Joseph Habersham, Georgia, Feb. 25, 1795; b 1750, d 1815.
 Gideon Granger, Connecticut, Jan. 26, 1801: b 1767, d 1822
 Return J. Meigs, Jr., Ohio, March 17, 1814; b 1766, d 1825.
 John McLean, Ohio, Dec. 9, 1823; b 1785, d 1861.
 William T. Barry, Kentucky, Mar. 9, 1829; b 1785, d 1835.
 Amos Kendall, Kentucky, May 1, 1835; b 1789, d Nov., 1869.
 John M. Niles, Connecticut, May 25, 1840; b 1787, d 1856.
 Francis Granger, New York, Mar. 6, 1841; b 1787, d 1868.
 Charles A. Wickliffe, Kentucky, Sept. 13, 1841; d Oct. 31, 1869
 Cave Johnson, Tennessee, March 5, 1845; d Nov. 23, 1866.
 Jacob Collamer, Vermont, March 7, 1849; b 1792, d Nov. 8, 1865
 Nathan K. Hall, New York, July 20 1850; b 1810, d 1861.
 Samuel D. Hubbard, Connecticut, October, 1852; b 1799, d 1855.
 James Campbell, Pennsylvania, March 5, 1853; b 1812.
 Aaron V. Brown, Tennessee, Mar. 5, 1857; b 1795, d 1859.
 Joseph Holt, Kentucky, March 5, 1859; b 1807.
 Horatio King, Maine, Feb. 12, 1861, acted 1860; b 1811.
 Montgomery Blair, Maryland, March 6, 1861; b 1813.
 William Dennison, Ohio, Sept., 1864; b 1815, d 1882.
 Alexander W. Randall, Wisconsin, July, 1866; b 1819, d July 25, 1872.
 John A. J. Cresswell, Maryland, March 4, 1869; b 1828
 Marshall Jewell, Connecticut, Aug. 24, 1874; b Oct. 20, 1825, d Feb., 1883
 James N. Tyner, Indiana, July 12, 1876; b Jan. 17, 1826.
 David M. Key, Tennessee, March 12, 1877; b Jan. 27, 1824.
 Horace Maynard, Tennessee, June 2, 1880; d 1882.
 Thomas L. James, New York, March 7, 1881; b 1831.
 Timothy O. Howe, Wisconsin, Dec. 20, 1881; b Feb. 24, 1816, d March 25, 1883.
 Walter Q. Gresham, Indiana, April 3, 1883; b March 17, 1833.
 William F. Vilas, Wisconsin, March, 1885.

ATTORNEYS-GENERAL.

The Attorney-General of the United States is chief law officer of Government, and as such is considered a member of the Cabinet. He is the constitutional legal adviser and defender of the Government.

Edmund Randolph, Virginia, Sept. 26, 1789; b , d 1813.
William Bradford, Pennsylvania, Jan. 27, 1794; b 1755, d 1795.

Charles Lee, Virginia, Dec. 10, 1795; b 1757, d 1815.

Theophilus Parsons,, Feb. 20, 1801.

Levi Lincoln, Massachusetts, Mar. 5, 1801; b 1749, d 1820.

Robert Smith, Maryland, Mar. 3, 1805; b 1757, d 1842.

John Breckenridge, Kentucky, Aug. 7, 1805; b , d 1806.

Cæsar A. Rodney, Delaware, Jan. 20, 1807; b , d 1824.

William Pinkney, Maryland, Dec. 11, 1811; b 1764, d 1822.

Richard Rush, Pennsylvania, Feb. 18, 1814; b 1780, d 1860.

William Wirt, Maryland, Dec. 16, 1817; b 1772, d 1834.

John McP. Berrien, Georgia, Mar. 9, 1829; b 1781, d 1856.

Roger B. Taney, Maryland, Dec. , 1831; b 1777, d 1864.

Benjamin F. Butler, New York, Nov. 15, 1833; b 1795, d 1858.

Felix Grundy, Tennessee, Sept. 1, 1838; b 1777, d 1840.

Henry D. Gilpin, Pennsylvania, Jan. 11, 1840; b 1801, d 1860.

John J. Crittenden, Kentucky, Mar. 5, 1841; b 1787, d 1863.

Hugh S. Legare, South Carolina, Sept. 13, 1841; b 1797, d 1843.

John Nelson, Maryland, July 1, 1843; b 1791, d 1860.

John Y. Mason, Virginia, Mar. 5, 1845; b 1795, d 1859.

Nathan Clifford, Maine, Oct. 17, 1846; b Aug. 18, 1803, d 1881.

Isaac Toucey, Connecticut, June, 1848; b 1793, d 1869.

Reverdy Johnson, Maryland, Mar. 6, 1849; b 1796, d Feb. 10, 1876.

John J. Crittenden, Kentucky, July 20, 1850; b 1786, d 1863.

Caleb Cushing, Massachusetts, Mar. 5, 1853; b 1800; d Jan. 2, 1879.

Jeremiah S. Black, Pennsylvania, March 5, 1857; b 1810.

Edwin M. Stanton, Pennsylvania, Dec., 1860; b 1815, d 1869.

Edward Bates, Missouri, March 6, 1861; b 1791, d 1869.

T. J. Coffey, (*ad int.*), Jan. 22, 1863.

James Speed, Kentucky, Dec. 6, 1864; b 1812.

Henry Stanbery, Kentucky, July, 1866; b 1803.

William M. Everts, New York, July, 1868; b 1818.

Ebenezer R. Hoar, Massachusetts, Mar. 4, 1869; b 1816.

Amos T. Akerman, Georgia, July 8, 1870.

George H. Williams, Oregon, Dec. 14, 1871; b Mar. 23, 1823.

Edwards Pierrepont, New York, April 26, 1875; b Mar. 4, 1817.

Alphonzo Taft,, May 22, 1876.

Charles Devens, Massachusetts, Mar. 12, 1877.
 Wayne MacVeagh, Pennsylvania, Mar. 7, 1881; b 1833.
 Benjamin H. Brewster, Pennsylvania, Dec. 19, 1881.
 A. H. Garland, Arkansas, Mar., 1885.

CHIEF JUSTICES OF THE SUPREME COURT.

The "Supreme Court" is the highest judicial Tribunal in the United States.

John Jay, New York, Sept. 26, 1789; b 1745, d 1829.
 John Rutledge, South Carolina, July 1, 1795; b 1739, d 1800.
 William Cushing (declined), Massachusetts, Jan. 27, 1796; b 1733, d 1810.
 Oliver Ellsworth, Connecticut, Mar. 4, 1796; b 1745, d 1807.
 John Jay (declined), New York, Dec. 19, 1800; b 1745, d 1829.
 John Marshall, Virginia, Jan. 31, 1801; b 1755, d 1835.
 Roger B. Taney, Maryland, Mar., 1836; b 1777, d 1864.
 Salmon P. Chase, Ohio, Dec. 6, 1864; b 1808, d 1873.
 Morrison R. Waite, Ohio, Jan. 21, 1874; b 1816.

ASSOCIATE JUSTICES OF THE SUPREME COURT.

John Rutledge, South Carolina, Sept. 26, 1789; b 1739, d 1800.
 William Cushing, Massachusetts, Sept. 27, 1789; b 1733, d 1810.
 Robert H. Harrison (declined), Maryland, Sept. 28, 1789; b 1745, d 1790.
 James Wilson, Pennsylvania, Sept. 29, 1789; b 1742, d 1798.
 John Blair, Virginia, Sept. 30, 1789; b 1732, d 1800.
 James Iredell, North Carolina, Feb. 10, 1790; b 1751, d 1799.
 Thomas Johnson, Maryland, Nov. 7, 1791; b 1732, d 1819.
 William Patterson, New York, Mar. 4, 1793; b 1745, d 1806.
 Samuel Chase, Maryland, Jan. 27, 1796; b 1741, d 1811.
 Bushrod Washington, Virginia, Dec. 20, 1798; b 1762, d 1829.
 Alfred Moore, North Carolina, 1799; b 1755, d 1810.
 William Johnson, South Carolina, Mar. 26, 1804; b 1771, d 1834.
 Brockholst Livingston, New York, Jan. 16, 1806; b 1757, d 1823.
 Thomas Todd, Kentucky, Mar. 4, 1807; b 1765, d 1826.
 Levi Lincoln (declined), Massachusetts, Jan. 7, 1811; b 1749, d 1820.
 John Quincy Adams, (declined), Massachusetts, Feb. 22, 1811; b 1767, d 1848.
 Gabriel Duval, Maryland, Nov. 18, 1811; b 1752, d 1844.
 Joseph Story, Massachusetts, Nov. 18, 1811; b 1779, d 1845.
 Smith Thompson, New York, Dec. 9, 1823; b 1767, d 1845.

- Robert Trimble, Kentucky, Mar. 9, 1826; b 1777, d 1828.
 John McLean, Ohio, Mar. 7, 1829; b 1785, d 1861.
 Henry Baldwin, Pennsylvania, Jan. 6, 1830; b 1779, d 1846.
 James M. Wayne, Georgia, Jan. 13, 1835; b 1790, d July 5, 1867.
 Philip P. Barbour, Virginia, Mar. 15, 1836; b 1783, d 1841.
 William Smith, Alabama, Mar. 8, 1837; b 1765, d 1840.
 John Catron, Tennessee, Mar. 8, 1837; b 1778, d May 30, 1865.
 John McKinley, Ala., Sept. 3, 1837; b 1780, d 1852.
 Peter V. Daniel, Virginia, Mar. 3, 1841; b 1785, d 1860.
 Samuel Nelson, New York, Feb., 1845; b 1792, d 1873.
 Levi Woodbury, New Hampshire, Jan., 1845; b 1789, d 1851.
 Robert C. Grier, Pennsylvania, 1846; b 1794, d 1870.
 Benjamin R. Curtis, Massachusetts, Oct. 10, 1851; resigned 1857; b 1809, d 1874.
 John A. Campbell, Alabama, 1853; b 1811.
 Nathan Clifford, Maine, Jan. 12, 1858; b 1803, d 1881.
 Noah H. Swayne, Ohio, Jan. 24, 1861; resigned Jan. 25, 1881; b 1805.
 Samuel F. Miller, Iowa, July 16, 1862; b 1816.
 David Davis, Illinois, 1862; resigned 1877; b 1815.
 Stephen J. Field, California, Mar. 10, 1866; b 1816.
 William M. Strong, Pennsylvania, Feb. 18, 1870; b 1808.
 Joseph P. Bradley, New Jersey, Mar. 24, 1870; b 1813.
 Ward Hunt, New York, Dec. 11, 1872; b 1811.
 John M. Harlan, Kentucky, Nov. 29, 1877; b 1833.
 William B. Woods, Georgia, 1880; b 1826.
 Stanley Matthews, Ohio, 1881; b July 21, 1824.
 Horace Gray, Massachusetts, 1881; b 1828.
 Samuel Blatchford, New York.

The Governments of Foreign Countries.

REPUBLICS.

Argentine Republic.—The legislative authority is vested in a National Congress, consisting of a Senate and a House of Deputies; the executive power is entirely in the hands of the President, who is held responsible for the acts of that department. The President, Gen. D. Jules Rocca, was elected in 1880, for a term of seven years, with a salary of \$20,000.

Bolivia.—The government of the republic is divided into a legislative department, called a Congress, consisting of a Senate and House of Representatives, and an executive department, consisting of the President, Vice-President and a Ministry, the heads of four departments. President of the Republic: Dr. N. Campero nominated President in 1880.

Chile.—The legislative department consists of an Assembly of two houses, the Senate and Chamber of Deputies. The executive authority is held by the President, with the assistance of a Council of State and a Cabinet, the heads of five departments. President: Domingo Santa Maria was elected for a term of five years, in 1881, with an income of \$18 000.

Colombia.—A confederative republic. It is governed in the legislative department by a Congress of two houses, the Senate and House of Representatives. The executive power resides with a President and seven Ministers, who are held responsible to Congress. President: Sr. F. J. Zaldua was elected for two years, in 1882.

Costa Rica.—The legislative department consists of a Congress, comprising a Senate and House of Representatives; the executive, of the President, elected for four years, and a Council of Ministers, the heads of five departments. President: Gen. P. Fernandez was elected President in 1882.

Ecuador.—The legislative department consists of a Congress of two houses, the Senate and House of Deputies; the executive, of the President and a Cabinet of three Ministers, who, with the President, are held responsible to Congress, and who, with seven other members, form the Council of State. President: Senor Caamayto was nominated President in 1883.

France.—The legislative power is controlled by an Assembly of two houses, Chamber of Deputies and Senate. The executive authority is in the hands of the chief magistrate, called the President of the republic. Francois P. Jules Grevy was elected President, for a term of 7 years, in 1879 at a salary of \$180,000.

Guatemala.—The legislative power is held by a National Assembly; and the executive is administered by the President, assisted by a Ministry, the heads of six departments. President: Gen. Rufino Barrios elected for six years in 1880.

Mexico.—The legislative power resides in a Congress, consisting of a Senate and a House of Representatives. The executive authority is held by the President and a Council of six, the heads of different departments. President: Gen. Manuel Gonzales elected for a term of four years, in 1880.

Peru.—The executive authority is intrusted to the President, assisted by two Vice-Presidents and a Cabinet of five Ministers. The legislative is invested in a Senate and House of Representatives.

San Domingo.—The legislative power is vested in a National Congress consisting of two houses, a Consejo Conservador and the Tribunado. The executive is intrusted to the President and a Ministry, the heads of the five departments. President: Gen. Ulysses Heureaux assumed the presidency for four years, in 1882.

Switzerland.—The supreme legislative and executive authority is exercised in an Assembly of two houses: the Ständerath, or State Council and the Nationalrath, or National Council. United, they are called the Federal Assembly. The President and Vice-President of the Federal Assembly are the first magistrates of the republic. President: Dr. Emile Walti, for one year (1884), at a salary of \$3,000.

Venezuela.—The legislative power is vested in a Congress of two houses, the Senate and House of Representatives. The executive is controlled by the President, through a Ministry of six members and a Federal Council of sixteen members. President: Gen. Don Antonio Guzman Blanco elected in February, 1882, for a term of two years.

KINGDOMS AND EMPIRES.

Austria and Hungary.—Each of these countries has its own Parliament, Ministers and government. They have a common army, navy and diplomacy, and a controlling body known as the Delegations. Franz Jose I. is Emperor of Austria and King of Hungary. He ascended the throne of Austria in 1848; crowned King of Hungary in 1867. His civil list is \$450,000.

Belgium.—The legislative power is in the King, the Chamber of Representatives and the Senate. No act of the King has effect unless signed by one of his Ministers, who are thus made responsible for all acts of the government. Leopold II. ascended the throne in 1865. His civil list is \$650,000.

Brazil.—The sovereign exercises the executive power through his responsible Ministers. The legislative authority is vested in a General Assembly, composed of a Senate and a House of Deputies. Emperor Dom Pedro II. succeeded to the throne in 1831.

China.—The administration is under the supreme direction of a Nei-ko, or Cabinet, consisting of four members, and these are assisted by two others, who are to see that nothing goes contrary to the civil or religious laws of the empire. Emperor Tsaitien succeeded to the throne in 1875. He is the sole high priest of the empire.

Denmark.—The legislative authority is exercised by the King, acting in concert with the Rigsdag, or Diet, consisting of an Upper House and a House of Commons. The executive power is in the hands of the King and his responsible Ministers. King Christian IX. succeeded to the throne in 1863. His civil list is \$277,775.

German Empire.—The supreme government is vested in the King of Prussia, the Bundelsrath and the Reichstag. The former represents the individual States, the latter the German Nation. Emperor Wilhelm I. was proclaimed Emperor of Germany in 1871; King of Prussia in 1861. The Emperor-King has a civil list of \$1,125,000.

Great Britain, Empire of.—The absolute power of the British Empire is held by a Parliament, consisting of two houses, an Upper and a Lower House. The sovereign is at the head of Parliament, and can alone summon Parliament. Victoria, Queen of Great Britain and Ireland, and Empress of India, ascended the throne of England in 1837. She has a civil list of \$1,925,000.

Greece, Kingdom of the Hellenes.—The executive power is vested in the King and his responsible Ministers, heads of the eight departments. The legislative power is given to a single chamber of representatives, called the Boule. Prince Georgios of Denmark accepted the crown of Greece in 1863. He has a civil list of \$260,890.

Italy.—The legislative power rests conjointly with the King and a Parliament composed of two houses, an Upper and a Lower House. The executive department is exercised exclusively by the King, assisted by the Ministers of nine departments. King Umberto I. succeeded to the throne in 1878. His civil list amounts to \$3,050,000.

Japan.—The supreme executive, as well as the highest legislative authority, is vested in the Great Council, at which the Emperor presides. The Gen-Roin, or Senate, deliberates on legislative matters, but its decisions are subject to the sanction of the Great Council. The executive powers are exercised by a Ministry of ten departments. The Mikado of Japan, Mutsee-Hito, succeeded to the throne in 1867. His civil list is \$1,748,800 per annum.

Netherlands.—The legislative authority is vested wholly in a parliament, called the States General. The executive is with the sovereign and a council of eight Ministers—the heads of the different departments. The reigning King, Willem III., succeeded to the throne in 1849. He has a civil list of \$250,000.

Ottoman Empire.—The legislative and executive power is exercised under the supreme direction of the Sultan, by two high dignitaries, the Grand Vizier, the head of the temporal government, and the Sheik-ul-Islam, the head of the church. The present Sultan, Abdul-Hamid II., succeeded to the throne in 1876. His civil list is variously reported at from five to ten millions of dollars.

Persia.—The Shah, or King, has absolute power over all his subjects, so far as he does not oppose the doctrines of the Mohammedan religion. Through his direction the executive powers are exercised by a Ministry of seven departments. The reigning Shah, Nassr-ed-Din, succeeded to the throne in 1848. The whole revenue of the country is at his disposal. His private fortune is estimated at \$20,000,000.

Portugal.—The legislative authority is given to the two houses, Upper and Lower, of the Cortes Geræs. The execu-

tive rests with the sovereign and a Cabinet of seven responsible Ministers. King Louis I. succeeded to the throne in 1861. His civil list amounts to \$400,000.

Russia.—The whole legislative, executive and judicial authority is vested in the Emperor, whose will alone is law. The administration is intrusted to four great councils: the Council of the Empire, the Directing Senate, the Holy Synod and the Committee of Ministers. They all communicate directly with the sovereign. Alexander III., Emperor of Russia, ascended the throne in 1881. The Emperor is in possession of the revenue from the crown lands, estimated at \$2,250,000.

Siam.—The legislative power is exercised by the King, in conjunction with a supreme Council of State and a Council of Ministers. The royal dignity is nominally hereditary. King Chulalongkorn I. succeeded to the throne in 1868.

Spain.—The legislative power rests with the King and Cortes Constituyentes, consisting of a Senate and a Congress. The executive is vested under the King, in a council of nine Ministers. Alfonso XII. was proclaimed King of Spain in 1874. He has a civil list of \$1,400,000.

Sweden and Norway.—The legislative authority of Sweden is vested in the Diet, or parliament of the realm, in concert with the sovereign. Every new law must have the assent of the crown. The executive power is held by the King, who acts under the advice of a Council of State, consisting of the Minister of State and ten members. The legislative power of Norway is held entirely by the Storting, or Great Court. The King has the right of veto over the laws passed by the Storting, but only for a limited period. The executive power is in the hands of the King, who acts by the advice of a Council of State, composed of two Ministers of State and nine Councillors. Oscar II. succeeded to the throne of Sweden and Norway in 1872. The civil list of the King and the royal family is \$575,525.

OUR ARMY.

There have been nineteen Commanders-in-Chief of the army of the United States, as follows :

General George Washington, June 15, 1775, to December 23, 1783; Major-General H. Knox, to June 20, 1784; Captain J. Doughty, to Aug. 12, 1784, senior officer of the army; Lieutenant-Colonel Cominandant J. Harmer, to March 4, 1792; Major-General A. St. Clair, to March 5, 1792; Major-General A. Wayne, to December 15, 1796; Brigadier-General J. Wilkinson, to July 3, 1798; Lieutenant-General G. Washington, to December 14, 1799; Major-General A. Hamilton, to June 1, 1800; Brigadier General J. Wilkinson, to July 27, 1812; Major-General H. Dearborn, to June 15, 1815; Major-General J. Brown, to February 24, 1828; Major-General A. Macomb, to June 25, 1841; Major-General W. Scott, to November 1, 1861, Brevet Lieutenant-General March 29, 1847; Major-General G. B. McClellan, to March 11, 1862; Major-General H. W. Halleck, to March 12, 1864; Lieutenant-General U. S. Grant, to March 4, 1869, General February 25, 1866; General W. T. Sherman, to November 1, 1883; Lieutenant-General P. H. Sheridan, to—.

Showing the force each of the thirteen States supplied for the Regular Army from 1775 to 1788 inclusive.

[From NILE'S REGISTER, July 31, 1830.]

New Hampshire.....	12,497	Delaware.....	2,386
Massachusetts.....	67,907	Maryland.....	13,912
Rhode Island.....	5,908	Virginia.....	26,678
Connecticut.....	31,939	North Carolina....	7,263
New York.....	17,781	South Carolina....	6,417
New Jersey.....	10,726	Georgia.....	2,679
Pennsylvania.....	25,678		
Total.....			231,791

Expense of the Revolutionary War.

It is not possible to ascertain with certainty the expenses of the Revolutionary War. An estimate was made in 1790 by the Register of the Treasury, of which the following is a general abstract:

The estimated amount of the expenditures of	
1775 and 1776 is, in Specie....	\$20,064,666.66
1777.....	24,986,646.85
1778.....	24,289,438.26
1779.....	10,794,620.65
1780.....	3,000,000.00
1781.....	1,942,465.30
1782.....	3,632,745.85
To 1783.....	3,226,583.45
Nov. 1, 1784.....	548,525.63

Forming an amount total of\$92,485,692.65

CONTINENTAL ARMY IN 1783.

COMMANDER-IN-CHIEF.

State. Date of Commis.
George Washington.....Virginia.....June 15, 1775

MAJOR GENERALS

Israel PutnamConnecticut.....June 19, 1775
Horatio GatesVirginiaMay 16, 1776
William Heath.....Massachusetts...Aug. 9, 1776
Nathaniel Greene.....Rhode Island...Aug. 9, 1776
Wm. Lord Stirling.....New JerseyFeb. 19, 1777
Arthur St. Clair.....Pennsylvania...Feb. 19, 1777
Benjamin Lincoln.....Massachusetts..Feb. 19, 1777
M. De LaFayette.....France.....July 31, 1777
Robert Howe.....North Carolina..Oct. 20, 1777
Alex. McDougall.....New York.....Oct. 20, 1777
Baron Stuben.....Prussia.....May 5, 1778
William SmallwoodMaryland.....Sept. 15, 1780
William Moultrie..South Carolina..Nov. 14, 1780
Henry KnoxMassachusetts...Nov. 15, 1780
Le Chevalier Du Portail. .France.....Nov. 16, 1780

BRIGADIER GENERALS.

James Clinton.....New York.....Aug. 9, 1776
Lachlan McIntosh.....GeorgiaSept. 16, 1776
John Patterson.....Massachusetts...Feb. 21, 1777
Anthony Wayne.....Pennsylvania...Feb. 1777
George Weeden.....Virginia.....Feb. 1777
P. Muhlenberg.....Virginia.....Feb. 1777
George Clinton.....New York.....Mar. 25, 1777
Edward Hand.....Pennsylvania...April 1, 1777
Charles Scott.....Virginia.....April 2, 1777
Jedediah Huntington.....Connecticut....May 12, 1777
John Stark.....New Hampshire..Oct. 4, 1777
Jethro Sumner.....North Carolina..Jan. 9, 1779
Isaac Huger.....South Carolina..Jan. 9, 1779
Mordecai Gist.....MarylandJan. 9, 1779
William Irvine.....Pennsylvania...Jan. 9, 1779
Daniel Morgan.....Virginia.....Oct. 13, 1780
Moses HazenJune 29, 1781
O. H. WilliamsMarylandMay 9, 1782
John Groaton.....Massachusetts...Jan. 7, 1783
Rufus PutnamMassachusetts...Jan. 7, 1783
Elias Dayton.....New Jersey.....Jan. 7, 1783

Major General Le Chevalier Du Portail...*Chief Engineer*
Major General Baron Stuben*Inspector General*
Col. Walter Stewart.....*Inspector of Northern Departm't*
Brigadier General Hand.....*Adjutant General*
Colonel Timothy Pickering ..*Quartermaster General*
John Cochran, Esq.*Director General of Hospitals*
Thomas Edwards.....*Judge Advocate General*
John Pierce, Esq.....*Postmaster General*

THE BATTLES OF 1775--1781.

The following comprises all the battles for freedom that took place from April 19, 1775, closing Oct. 19, 1781,—six years and six months. The British sent 134,000 soldiers and sailors to the war. The Colonists met them with 230,000 Colonists and 50,000 militia. The British let loose Indians, and equally savage Hessians. The Colonists had for their allies the brave and courteous Frenchmen. The leading battles of the war—those particularly worthy of celebration—are Concord and Lexington, Bunker Hill, Long Island, White Plains, Trenton, Princeton, Bennington, Saratoga, Monmouth, King's Mountain, Cowpens, Eutaw Springs and Yorktown. These are of national interest. Many of the others are local. The disposition is to celebrate them all—victories and defeats—to recall the deeds of our ancestors, and have a good time generally.

Preserve the following list of Revolutionary battles:

Lexington (first skirmish).....	April 10, 1775
Ticonderoga.....	May 10, 1775
Bunker Hill.....	June 17, 1775
Montreal (Ethan Allen taken).....	Sept. 25, 1775
St. Johns besieged and captured.....	Nov. 3, 1775
Great Bridge, Va.....	Dec. 9, 1775
Quebec (Montgomery killed).....	Dec. 31, 1775
Moore's Creek Bridge.....	Feb. 27, 1776
Boston (British fled).....	March 17, 1776
Fort Sullivan, Charleston.....	June 28, 1776
Long Island.....	Aug. 26, 1776
Harlem Plains.....	Sept. 16, 1776
White Plains.....	Oct. 28, 1776
Fort Washington.....	Nov. 16, 1776
Trenton.....	Dec. 27, 1776
Princeton.....	Jan. 3, 1777
Hatfieldtown.....	July 7, 1777
Bennington.....	Aug. 16, 1777
Brandywine.....	Sept. 11, 1777
First Battle of Saratoga.....	Sept. 19, 1777
Zaoli.....	Sept. 20, 1777
Germantown.....	Oct. 4, 1777
Forts Clinton and Montgomery taken.....	Oct. 6, 1777
Second battle of Saratoga.....	Oct. 7, 1777
Surrender of Burgoyne.....	Oct. 13, 1777
Fort Mercer.....	Oct. 22, 1777
Fort Mifflin.....	Nov. —, 1777
Monmouth.....	June 28, 1778
Wyoming.....	July 4, 1778
Quaker Hill, R. I.....	Aug. 28, 1778
Savannah.....	Dec. 29, 1778
Kettle Creek, Ga.....	Feb. 14, 1779
Briar Creek.....	March 3, 1779
Stoney Ferry.....	June 20, 1779
Stoney Point.....	July 16, 1779
Savannah.....	Aug. 9, 1779
Paulus' Hook.....	Aug. 13, 1779
Chemung (Indians).....	Aug. 29, 1779
Charlestown (surrendered to the British).....	May 12, 1780
Springfield.....	June 28, 1780
Rocky Mount.....	July 3, 1780
Hanging Rock.....	Aug. 6, 1780
Sanders' Creek, near Camden.....	Aug. 16, 1780
King's Mountain.....	Oct. 7, 1780
Fish Dam Ford, Broad Riv. r.....	Nov. 18, 1780
Blackstocks.....	Nov. 20, 1780
Cowpens.....	Jan. 17, 1781
Guilboro.....	March 15, 1781
Hookirk's Hill.....	April 25, 1781
Ninety-Six (besieged).....	May and June, 1781
Augusta (besieged).....	May and June, 1781
Jamestown.....	July 9, 1781
Eutaw Springs.....	Sept. 8, 1781
Yorktown (Cornwallis surrendered).....	Oct. 19, 1781

THE ARMY OF THE UNITED STATES DURING THE REBELLION.

Statement showing the number of men furnished by each state since April 1, 1861, in the different calls for men. Also, the number of men credited to each state upon the basis of three years as a standard of computation.

[illegible]

List of Major and Brigadier Generals

Appointed in the Volunteer Service from 1861 to
1865 Inclusive.

Angier, Christopher C.	{ Brigadier General. Major General.
Buell, Don Carlos	{ Brigadier General. Major General.
Buford, Napoleon B.	{ Brigadier General. Major General.
Burnside, Ambrose E.	{ Brigadier General. Major General.
Crook, George	{ Brigadier General. Major General.
Garfield, James A.	{ Brigadier General. Major General.

MAJOR GENERALS.

Banks, Nathaniel P.
Butler, Benjamin F.
Butterfield, Daniel.
Cadwallader, George.
Canby, Edward R. S.
Casey, Silas.
Crittenden, Thomas L.
Davies, Henry E.
Doubleday, Abner.
Emery, William H.
Fessenden, Francis.
Foster, John G.
Franklin, William B.
French, William H.
Gibbon, John.
Gillem, Alvan C.
Gillmore, Quincy A.
Granger, Gordon.
Grant, Ulysses S.
Grierson, Benjamin H.
Griffin, Charles.
Hamilton, Charles S.
Hancock, Winfield S.
Hartsuff, George L.
Hazen, William B.
Helntzelman, Samuel P.
Herron, Francis J.
Hitchcock, Ethan A.
Hooker, Joseph.
Howard, Oliver O.
Hunter, David.
Hurlburt, Stephen A.
Kearney, Philip.
Keyes, Erasmus D.
Leggett, Mortimer D.
Logan, John A.
Manafield, Joseph K. F.
McClelland, John A.
McCook, Alex. McD.
McDowell, Irvin.
McPherson, James B.
Meade, George G.
Merritt, Wesley.
Milroy, Robert H.
Mitchell, Ormsby.

Morgan, Edwin D.
Morrer, Joseph A.
Negley, James S.
Nelson, William.
Newton, John.
Oglesby, Richard I.
Ord, Edward C. C.
Osterhouse, Peter I.
Palmer, John M.
Parke, John G.
Peck, John I.
Pleasanton, Alfred.
Pope, John.
Porter, Fitz John.
Potter, Robert B.
Prentiss, Benjamin M.
Reno, Jesse L.
Reynolds, Jno. F.
Reynolds, Joseph J.
Richardson, Israel B.
Rosecrans, William S.
Rousseau, Lovell H.
Schenck, Robert C.
Schofield, John M.
Schurz, Carl.
Sedgwick, John.
Sheridan, Philip H.
Sherman, William T.
Sickles, Daniel E.
Sigel, Franz.
Slocum, Henry W.
Smith, Andrew J.
Smith, Charles F.
Smith, Giles A.
Smith, William F.
Stahel, Julius H.
Stanley, David S.
Stedman, James B.
Steele, Frederick.
Stevens, Isaac I.
Stoneman, George.
Strong, George C.
Sumner, Edwin V.
Swayne, Wager.
Skyes, George.

MAJOR GENERALS—CONTINUED.

Terry, Alfred H.
 Thomas, George H.
 Wallace, Lewis.
 Warren, Gouverneur K.
 Washburne, C. C.
 Weitzel, Godfrey.

Whipple, Amiel W.
 Willcox, Orlando B.
 Wilson, James H.
 Wood, Thomas I.
 Wright, Horatio G.

BRIGADIER GENERALS.

Abercrombie, John I.
 Allen, Robert.
 Alvord, Benjamin.
 Ames, Adelbert.
 Ammen, Jacob.
 Andrews, Christopher C.
 Andrews, George L.
 Arnold, Louis G.
 Arnold, Richard.
 Asboth, Alexander.
 Averell, William W.
 Ayres, Romeyn B.
 Bailey, Joseph.
 Baird, Absalom.
 Baker, Lafayette C.
 Barlow, Francis C.
 Barnard, John G.
 Barnes, James.
 Barnum, Henry A.
 Barry, William F.
 Bartlett, Joseph J.
 Bartlett, William F.
 Baxter, Henry.
 Bayard, George D.
 Beal, George L.
 Beatty, John.
 Beatty, Samuel.
 Belknap, William W.
 Benham, Henry W.
 Benton, William P.
 Berry, Hiram G.
 Bidwell, David D.
 Birge, Henry W.
 Birney, David B.
 Birney, William.
 Blair, Frank P., Jr.
 Blenker, Louis.
 Blunt, James G.
 Bohlen, Henry.
 Bowen, James.
 Boyle, Jeremiah T.
 Bradley, Luther P.
 Bragg, Edward S.
 Brannan, John M.
 Brayman, Mason.
 Briggs, Henry S.
 Brislin, James S.
 Brooke, John R.
 Brooks, William T. H.
 Brown, Egbert B.
 Buchanan, Robert C.
 Buckingham, C. P.
 Buckland, Ralph P.
 Buford, John.
 Burbidge, Stephen B.
 Burnham, Hiram.
 Burns, William W.
 Bussey, Cyrus.

Busteed, Richard.
 Caldwell, John C.
 Cameron, Robert A.
 Campbell, Charles T.
 Campbell, William B.
 Carleton, James H.
 Carlin, William P.
 Carr, Eugene A.
 Carr, Joseph B.
 Carrington, Henry B.
 Carroll, Samuel S.
 Carter, Samuel P.
 Catterson, Robert F.
 Chamberlain, Joshua L.
 Chambers, Alexander.
 Champlin, Stephen G.
 Chapin, Edward P.
 Chapman, George H.
 Chetlain, Aug. L.
 Chrysler, Morgan H.
 Clayton, Powell.
 Cochrane, John.
 Connor, Patrick E.
 Connor, Seiden.
 Cook, John.
 Cooper, James.
 Cooper, Joseph A.
 Copeland, Joseph T.
 Corcoran, Michael.
 Corse, John M.
 Couch, Darius N.
 Cowdin, Robert.
 Cox, Jacob D.
 Craig, James.
 Crawford, Samuel W.
 Crittenden, Thomas T.
 Crocker, Marcellus M.
 Croxton, John T.
 Cruft, Charles.
 Curtis, Martin N.
 Curtis, Samuel R.
 Cutler, Lysander.
 Dana, Napoleon I. T.
 Davidson, John W.
 Davies, Thomas A.
 Davis, Edmund J.
 Davis, Jefferson C.
 Deitzler, George W.
 Dennis, Elias S.
 Dent, Frederick T.
 Denver, James W.
 DeRussy, Gustavus A.
 DeTrobriand, Philip R.
 Devens, Charles.
 Devin, Thomas C.
 Dewey, Joel A.
 Dodge, Charles C.
 Dodge, Grenville M.

BRIGADIER GENERALS—CONTINUED.

Doolittle, Charles C.
 Dow, Neal.
 Duffie, Alfred N.
 Dumont, Ebenezer.
 Duryee, Abraham.
 Duval, Isaac H.
 Dwight, William.
 Edwards, John.
 Edwards, Oliver.
 Egan, Thomas W.
 Elliot, Washington L.
 Este, George F.
 Eustis, Henry L.
 Ewing, Charles.
 Ewing, Hugh.
 Ewing, Thomas, Jr.
 Fairchild, Lucius.
 Farnsworth, Evan J.
 Farnsworth, John F.
 Ferrero, Edward.
 Ferry, Orris S.
 Fessenden, James D.
 Fisk, Clinton B.
 Force, Manning F.
 Foster, Robert S.
 Fry, Speed S.
 Fuller, John W.
 Gamble, William.
 Garrard, Kenner.
 Garrard, Theophilus T.
 Geary, John W.
 Gibbs, Alfred.
 Gilbert, Charles C.
 Gilbert, James J.
 Gordon, George H.
 Gorman, Willis A.
 Graham, Charles K.
 Graham, Lawrence P.
 Granger, Robert S.
 Grant, Lewis A.
 Greene, George L.
 Gregg, David McM.
 Gresham, Walter O.
 Griffin, Simon G.
 Grose, William.
 Grover, Cuvier.
 Hackleman, Pleasant A.
 Hamblin, Joseph E.
 Hamilton, Andrew J.
 Hardie, James A.
 Hardin, Martin D.
 Harding, Abner C.
 Harker, Charles G.
 Harland, Edward.
 Harris, Thomas M.
 Harrow, William.
 Hartnuff, John F.
 Hascall, Milo S.
 Hatch, Edward.
 Hatch, John P.
 Hawkins, John P.
 Hawley, Joseph R.
 Hayes, Joseph.
 Hayes, Rutherford B.
 Haynie, Isham N.
 Hays, Alexander.
 Hays, William.
 Heckman, Charles A.

Hinks, Edward W.
 Hobson, Edward H.
 Hovey, Levin P.
 Hovey, Charles E.
 Howe, Albion F.
 Hunt, Lewis C.
 Ingalls, Rufus.
 Jackson, Conrad F.
 Jackson, James S.
 Jackson, Nathaniel I.
 Jackson, Richard H.
 Jameson, Charles D.
 Johnson, Andrew.
 Johnson, Richard W.
 Jones, Patrick H.
 Judah, Henry M.
 Kane, Thomas L.
 Kantz, August V.
 Keim, William H.
 Kelley, Benjamin F.
 Kenley, John R.
 Ketchum, John H.
 Ketchum, William S.
 Kirman, James L.
 Kilpatrick, Judson.
 Kimball, Nathan.
 King, John H.
 King, Rufus.
 Kirby, Edmund.
 Kirk, Edward N.
 Knipe, Joseph F.
 Krzyonowski, Mademier.
 Lander, Frederick W.
 Lane, James H.
 Lanman, Jacob G.
 Lawlor, Michael K.
 Ledlie, James H.
 Lee, Albert L.
 Lockwood, Henry A.
 Long, Eli.
 Lowell, Charles R.
 Lucas, Thomas I.
 Lyon, Nathaniel.
 Lytle, William H.
 Mackenzie, Ranald S.
 Maltby, Jasper A.
 Manson, Mahlon D.
 Marcy, Randolph B.
 Marston, Gilman.
 Martindale, John H.
 Mason, John S.
 Matthies, Charles L.
 McArthur, John.
 McCall, George A.
 McCook, Daniel.
 McCook, Edward M.
 McCook, Robert L.
 McGinnis, George F.
 McIntosh, John B.
 McKean, Thomas J.
 McKinstry, Justus.
 McLean, Nathaniel C.
 McMillan, James W.
 McNeal, John.
 Meagher, Thomas F.
 Meredith, Solomon.
 Meredith, Sullivan A.
 Miller, John F.

BRIGADIER GENERALS — CONTINUED.

Miller, Stephen
 Mitchell, John G.
 Mitchell, Robert B.
 Montgomery, William R.
 Morgan, Charles H.
 Morgan, James D.
 Morgan, George W.
 Morris, William H.
 Morton, James StC.
 Nagle, James.
 Nagler, Henry M.
 Neill, Thomas H.
 Nickerson, Frank S.
 Oliver, John M.
 Opoyke, Emerson.
 Orme, William W.
 Osborn, Thomas O.
 Owen, Joshua T.
 Paine, Charles J.
 Paine, Eleazer A.
 Paine, Halbert E.
 Palmer, Innis N.
 Patrick, Marsena R.
 Patterson, Francis E.
 Paul, Gabriel R.
 Pennypacker, Galusha.
 Penrose, William H.
 Phelps, John S.
 Phelps, John W.
 Platt, Abram S.
 Pierce, Byron R.
 Pile, William A.
 Pitcher, Thomas G.
 Plummer, Joseph B.
 Poe, Orlando M.
 Porter, Andrew.
 Potter, Edward E.
 Potter, Joseph H.
 Potts, Benjamin F.
 Powell, William H.
 Pratt, Calvin E.
 Price, Thomas L.
 Prince, Henry.
 Quinby, Isaac F.
 Ranson, Thomas E. G.
 Raum, Green B.
 Rawlins, John A.
 Reed, Hugh T.
 Reilly, James W.
 Revere, Joseph W.
 Rice, Americus V.
 Rice, Elliot W.
 Rice, James C.
 Rice, Samuel A.
 Ricketts, James B.
 Roberts, Benjamin S.
 Robinson, James S.
 Robinson, Jonathan C.
 Roiman, Isaac P.
 Ross, Leonard F.
 Rowley, Thomas A.
 Rucker, Daniel H.
 Ruger, Thomas H.
 Russell, David A.
 Rutherford, Friend S.
 Salomon, Frederick.
 Sanborn, John B.
 Sanders, William P.
 Saxton, Rufus.
 Scammon, Eliakim P.
 Schemmelfinnig, Alexander.
 Schoeff, Albin.
 Scott, Robert K.
 Seward, William H., Jr.
 Seymour, Truman.
 Shackelford, James H.
 Shaler, Alexander.
 Shepard, Isaac F.
 Shepley, George F.
 Sherman, Francis T.
 Sherman, Thomas W.
 Shields, James.
 Sibley, Henry H.
 Sill, Joshua W.
 Slack, James E.
 Slemmer, Adam I.
 Slough, John P.
 Smith, Green Clay.
 Smith, Gustavus A.
 Smith, Jonathan E.
 Smith, Morgan L.
 Smith, Thomas C. H.
 Smith, Thomas K.
 Smith, William S.
 Smith, Thomas A.
 Spears, James G.
 Spinola, Francis B.
 Sprague, Jonathan W.
 Stannard, George I.
 Starkweather, John C.
 Stevenson, Jonathan D.
 Stevenson, Thomas G.
 Stolbrand, Carlos I.
 Stone, Charles P.
 Strong, William K.
 Stuart, David.
 Stumbaugh, Frederick S.
 Sturgis, Samuel D.
 Sullivan, Jeremiah C.
 Sully, Alfred.
 Sweeny, Thomas W.
 Taylor, George W.
 Taylor, Wilson.
 Terrill, William R.
 Terry, Henry D.
 Thayer, John M.
 Thomas, Henry G.
 Thomas, Stephen.
 Thurston, Charles M.
 Tibbette, William B.
 Tillson, Davis.
 Todd, Jonathan B. S.
 Torbett, Alfred T. A.
 Tower, Zealous B.
 Turner, John W.
 Tuttle, James M.
 Tyler, Daniel.
 Tvler, Erastus B.
 Tyler, Robert O.
 Tyndale, Hector.
 Ullman, Daniel.
 Underwood, Adin B.
 Upton, Emory.
 Van Allen, James H.
 Van Cleave, Horatio P.
 Vanderveer, Ferdinand.

BRIGADIER GENERALS—CONTINUED.

Vandever, William.	Weed, Stephen H.
Van Vliet, Stewart.	Wells, William.
Van Wyck, Charles H.	Welsh, Thomas.
Veatch, James C.	Wessels, Henry W.
Viele, Egbert L.	West, Joseph R.
Vincent, Strong	Wheaton, Frank.
Vinton, Francis L.	Whipple, William D.
Vodges, Israel.	Whitaker, Walter C.
Von Steinwehr, Adolph.	White, Julius.
Wade, Melancthon S.	Wild, Edward A.
Wadsworth, James S.	Williams, Alpheus S.
Wagner, George D.	Williams, David H.
Walcutt, Charles C.	Williams, Nelson G.
Wallace, William H. L.	Williams, Seth.
Ward, John H. H.	Williams Thomas.
Ward, William T.	Williamson, James A.
Warner, James M.	Willick, August.
Warren, Fitz-Henry.	Woods, Charles R.
Watkins, Louis D.	Woods, William H.
Webb, Alexander S.	Wright, George.
Webber, Max.	Zook, Samuel K.

LIST OF GENERAL OFFICERS.

(NOT BREVET.)

Anderson, Robert.....	Brigadier General.
Barnes, Joseph K.....	Brigadier General and Surgeon General.
Cooke, Phillip StG.....	Brigadier General.
Delatfield, Richard.....	Brigadier General and Chief of Engineers.
Dyer, Alexander B.....	Brigadier General and Chief of Ordnance.
Eaton, Amos B.....	Brigadier General and Com. Gen. of Subsistence.
Fremont, John C.....	Major General.
Fry, James B.....	Brigadier General and Provost Marshall General.
Grant, Ulysses S.....	Major General, Lieut. General and General.
Halleck, Henry W.....	Major General.
Hammond, Wm. A.....	Brigadier General and Surgeon General.
Hancock, W. S.....	Brigadier General and Major General.
Holt, Joseph.....	Brigadier General and Judge Advocate General.
Hooker, Joseph.....	Brigadier General.
Howard, Oliver O.....	Brigadier General.
Mansfield, J. K. F.....	Brigadier General.
Meade, George G.....	Brigadier General and Major General.
Melrs, M. C.....	Brigadier General and Quartermaster General.
McTear, George B.....	Major General.
Mcowell, Irvin.....	Brigadier General and Major General.
McL'herson, J. B.....	Brigadier General.
Pope, John.....	Brigadier General.
Ramsay, George D.....	Brigadier General and Chief of Ordnance.
Rawlins, John A., Brig. Gen. and Chief of Staff to the Gen. of Army.	
Ripley, James W.....	Brigadier General and Chief of Ordnance.
Rosecrans, William S.....	Brigadier General.
Sherman, Wm. T.....	Brig. Gen., Maj. Gen., Lieut. Gen. and General.
Sheridan, Philip H.....	Brig. Gen., Maj. Gen., Lieut. Gen. and General.
Sumner, Edwin V.....	Brigadier General.
Taylor, Joseph P.....	Brig. Gen. and Commissary Gen. of Subsistence.
Terry, Alfred A.....	Brigadier General.
Thomas, George H.....	Brigadier General and Major General.
Thomas, Lorenzo.....	Brigadier General and Adjutant General.
Totten, Joseph G.....	Brigadier General and Chief Engineer.

List of General Officers at the Commencement and Close of the Revolutionary War.

FIRST CONTINENTAL ARMY, 1773.

COMMANDER-IN-CHIEF.

State. Date of Commis.

George Washington.....Virginia.....June 17, 1775

MAJOR GENERALS.

Artemas WardMassachusetts...June 17, 1775
Charles Lee.....Virginia.....June 17, 1775
Philip Schuyler.....New York.June 19, 1775
Israel Putnam.....Connecticut.....June 19, 1775

BRIGADIER GENERALS.

Seth Pomeroy.....Massachusetts...June 22, 1775
Richard Montgomery.....New York.....June 22, 1775
David Wooster.....Connecticut.....June 22, 1775
William Heath.....Massachusetts...June 22, 1775
Joseph Spencer.....Connecticut.....June 22, 1775
John Thomas.....Massachusetts...June 22, 1775
John Sullivan.....New Hampshire..June 22, 1775
Nathaniel Greene.....Rhode Island....June 22, 1775

ADJUTANT GENERAL.

Horatio Gates.....Virginia.....June 17, 1775

BIG CHURCHES.—Very few churches in America have a seating capacity of over 1,500. The following table shows the size of some of the largest churches in Europe :

	<i>Persons.</i>
St. Peter's Church at Rome will hold.....	54,000
Milan Cathedral.....	37,000
St. Paul's at Rome.....	32,000
St. Paul's at London.....	35,600
St. Petronio at Bologna.....	24,400
Florance Cathedral.....	24,300
Antwerp Cathedral.....	24,000
St. Sophia, Constantinople.....	23,000
St. John Lateran.....	22,900
Notre Dame at Paris.....	21,000
Pisa Cathedral.....	13,000
St. Stephen's at Vienna.....	12,400
St. Dominic's at Bologna.....	12,000
St. Peter's at Bologna.....	11,400
Cathedral of Vienna.....	11,000
St. Mark's Venice.....	7,000
Spurgeon's Tabernacle.....	7,000

NOTABLE BRIDGES OF THE WORLD.

Brooklyn bridge was commenced, under the direction of J. Roebling, in 1870, and completed in about thirteen years. It is 3,475 feet long and 135 feet high. The cost was nearly \$15,000,000.

The Canti-Lever bridge, over the Niagara, is built almost entirely of steel. Its length is 910 feet, the total weight is 3,000 tons, and the cost was \$900,000.

The Niagara Suspension bridge was built by Roebling, in 1852-55, at a cost of \$400,000. It is 245 feet above water, 821 feet long, and the strength is estimated at 1,200 tons.

The bridge at Havre de Grace, over the Susquehanna, is 3,271 feet long, and is divided into twelve wooden spans, resting on granite piers.

The Britannia bridge crosses the Menai strait, Wales, at an elevation of 103 feet above high water. It is of wrought iron, 1,511 feet long, and was finished in 1850. Cost, \$3,008,000.

The new London bridge is constructed of granite, from the designs of L. Rennier. It was commenced in 1824, and completed in about seven years, at a cost of \$7,291,000.

The old London bridge was the first stone bridge. It was commenced in 1176, and completed in 1209. Its founder, Peter of Colechurch, was buried in the crypt of the chapel erected on the centre pier.

Coalbrookdale Bridge, England, is the first cast-iron bridge. It was built over the Severn in 1779.

The bridge at Burton, over the Trent, was formerly the longest bridge in England, being 1,545 feet. It is now partly removed. Built in the twelfth century.

The Rialto, at Venice, is said to have been built from designs of Michael Angelo. It is a single marble arch, 98½ feet long, and was completed in 1591.

The Bridge of Sighs, at Venice, over which condemned prisoners were transported from the hall of judgment to the place of execution, was built in 1589.

The bridge of the Holy Trinity, at Florence, was built in 1569. It is 322 feet long, constructed of white marble, and stands unrivaled as a work of art.

The covered bridge at Pavia, over the Ticino, was built in the fourteenth century. The roof is held by 100 granite columns.

Sublican bridge, at Rome, the oldest wooden bridge known, is said to have been erected in the seventh century. Twice it has been rebuilt, and the ruins of the last structure are still visible.

Rush street bridge, Chicago, Ill., erected in 1884, at a cost of \$132,000, is the largest general traffic drawbridge in the world. Its roadway will accommodate four teams abreast, and its foot passages are seven feet wide in the clear. It is swung by steam power, and lighted by electric light.

A QUEER COMPILATION.

According to the *New York Sun* the table below shows the number of words in each inaugural address, also how often the personal pronoun "I" was used.

<i>President.</i>	<i>No. of Words.</i>	<i>No. of I's.</i>
Washington, first term	1,300	20
Washington, second term	134	6
J. Adams	2,311	13
Jefferson, first term	1,526	19
Jefferson, second term	2,123	16
Madison, first term	1,170	11
Madison, second term	1,142	4
Monroe, first term	3,322	19
Monroe, second term	4,466	26
J. Q. Adams	2,944	14
Jackson, first term	1,116	11
Jackson, second term	1,167	6
Van Buren	3,884	38
Harrison	8 578	38
Tyler	1,643	15
Polk	4 904	18
Taylor	1,096	18
Pierce	3,319	25
Buchanan	2,772	13
Lincoln, first term	3,588	43
Lincoln, second term	588	1
Johnson	362	15
Grant, first term	1,139	19
Grant, second term	1,332	24
Hayes	2,472	16
Garfield	2,949	10
Arthur	431	1
Cleveland	1,688	5

Millard Fillmore took the oath without delivering an inaugural address.

Wedding Anniversaries.

First Anniversary	Cotton Wedding.
Second Anniversary	Paper Wedding.
Third Anniversary	Leather Wedding.
Fifth Anniversary	Wooden Wedding.
Seventh Anniversary	Woolen Wedding.
Tenth Anniversary	Tin Wedding.
Twelfth Anniversary	Silk and Fine Linen Wedding.
Fifteenth Anniversary	Crystal Wedding.
Twentieth Anniversary	China Wedding.
Twenty-fifth Anniversary	Silver Wedding.
Thirtieth Anniversary	Pearl Wedding.
Fortieth Anniversary	Ruby Wedding.
Fiftieth Anniversary	Golden Wedding.
Seventy-fifth Anniversary	Diamond Wedding.

OCEAN CABLES.

The President of one of our most prominent telegraph companies has kindly furnished the following list of existing ocean cables, which are as follows :

Two known as the "Mackay-Bennett," owned by the Commercial Cable Company, laid in 1884, including short sections from Nova Scotia, first to Rockport, near Gloucester, Mass., second to Coney Island, thence underground to the office of the Company in Wall Street, New York city.

Two "Gould" cables owned by the American Cable Company, laid in 1881, leased to the Western Union Telegraph Company for fifty years. Both are now broken.

THREE "Anglo" cables, owned by the Anglo-American Telegraph Company, laid, one in 1873, one in 1874, and one in 1880, operated in connection with the Western Union Telegraph Company.

ONE French cable, owned by the Anglo-American Company, including a short section from St. Pierre to Duxbury, laid in 1869, operated by the Western Union Telegraph Company.

ONE French Cable, owned by the Compagnie Française de Telegraphie Transatlantic, laid in 1879, including a short section from North Eastham to St. Pierre, Miquelon, operated in connection with the Western Union Telegraph Company, now broken.

ONE, "direct" cable, laid in 1874, including a short section from Torbay, N. S., to Rye Beach, N. H., at present broken, and operated in connection with the Western Union Telegraph Company.

The average life of an ocean cable is, as now ascertained according to the best data, about twelve years.

TUNNELS OF THE WORLD.

Mount St. Gothard, 48,840 feet long (the longest in the world); Mount Cenis, 39,840 feet long; Hoosac, 25,080 feet long; Nochistongo, 21,659 feet long; Sutro, 21,120 feet long; Riquivel, 18,623 feet long; Nerthe, 15,153 feet long; Blaizy, 13,455 feet long; Thames and Medway, 11,880 feet long.

DATES OF DIGNITIES.

The first English Duke was Edward, the Black Prince; he was created Duke of Cornwall by his father, Edward III., in 1337.

The title of Marquis was first bestowed by Richard II. on his favorite, Robert de Vere, Earl of Oxford, created Marquis of Dublin in 1386.

The Saxon titles of Alderman or Earl, and Thane, were changed into Earl and Baron by William I.

The title of Viscount was long in use in France before it was bestowed on any person in England; the first person who held it was John Beaumont, created Viscount Beaumont and Count of Boulogne in France in 1440.

The order of Baronets was established by James I. in 1611, and exists only in the British Dominions.

The Saxons, in the fifth and sixth centuries, founded the Heptarchy, meaning the seven States, though there really were nine; these were all subdued by Egbert, King of Wessex, who, in consequence, took the title of King of England in 827.

The Norman Kings, beginning with William I. in 1066, were also Dukes of Normandy.

Henry II., in 1172, styled himself Lord of Ireland, which title Henry VIII. changed into King, in 1541.

SEVEN WONDERS OF THE WORLD.

A name given to seven very remarkable objects of the ancient world.

The Pyramids of Egypt. Pharos of Alexandria. Walls and Hanging Gardens of Babylon. Temple of Diana at Ephesus. The Statue of the Olympian Jupiter. Mausoleum of Artemisia. Colossus of Rhodes.

SEVEN WISE MEN OF GREECE.

These men, distinguished for their practical sagacity and wise maxims on the principles of life, flourished in Greece in the sixth century, B. C. Their names were: SOLOON, CHILO. PITTACUS, BIAS, PERIANDER, CLEOBULUS and THALES.

THE SEVEN SLEEPERS.

According to a legend of early Christianity, seven noble youths of Ephesus, having fled from persecution to a certain cavern for refuge, where they were discovered and walled in for a cruel death, were made to fall asleep, and in that state lived for two centuries. Their names are said to have been: MAXIMIAN, MALCHUS, MARTINIAN, DENIS, JOHN, SERAPION and CONSTANTINE.

The Derivations of the Names of the Months.

JANUARY—The Roman Janus presided over the beginning of everything; hence the first month of the year was called after him.

FEBRUARY—The Roman festival Februs was held on the 15th day of this month, in honor of Lupercus, the god of fertility.

MARCH—Named from the Roman god of war, Mars.

APRIL—Lat. Aprilis, probably derived from Aperire, to open; because spring generally begins and the buds open in this month.

MAY—Lat. Maius, probably derived from Maia, a feminine divinity worshiped at Rome on the first day of this month.

JUNE—Juno a Roman divinity worshiped as the Queen of Heaven.

JULY (Julius)—Julius Cæsar was born in this month.

AUGUST—Named by the Emperor Augustus Cæsar, B. C. 30, after himself, as he regarded it a fortunate month, being that in which he had gained several victories.

SEPTEMBER (septem, or 7).—September was the seventh month in the old Roman calendar.

OCTOBER (octo).—Eighth month of the old Roman year.

NOVEMBER (novem, or 9).—November was the ninth month in the old Roman year.

DECEMBER (decem, or 10).—December was the tenth month of the early Roman year. About the 21st of this month the sun enters the Tropic of Capricorn, and forms the winter solstice.

Days of the Week.

SUNDAY (Sax. Sunnandæg, day of the sun).

MONDAY (Ger. Montag, day of the moon).

TUESDAY (Ang. Sax. Tiwesdæg, from Tiw, the god of war).

WEDNESDAY (Ang. Sax. Wodnesdæg, from Odin, the god of storms).

THURSDAY (Dan. Thor, the god of thunder).

FRIDAY (Sax. Frigedæg, day of Freya, goddess of marriage).

SATURDAY (day of Saturn, the god of time).

The names of the seven days of the week originated with the Egyptian astronomers. They gave them the names of the sun, moon and five planets; viz., Mars, Mercury, Jupiter, Venus and Saturn.

The Chinese and Thibetans have a week of five days, named after iron, wood, water, feathers and earth.

Comparative Retail Prices of the Necessaries of Life

IN EUROPE AND THE UNITED STATES IN 1878.

[Condensed from the Report of the Secretary of State on the State of Labor in Europe, derived from facts reported by the United States Consuls, Washington, 1879.]

	Belgium.	France.	Ger- many.	Italy.	Switzer- land.	Great Britain.	UNITED STATES.	
							New York.	Chicago.
BEEF—Roast.....lb.	Cents. 20	Cents. 22	Cents. 22	Cents. 20	Cents. 30	Cents. 22	Cents. 12 to 16	Cents. 8 to 12½
BEEF—(Corned).....lb.	16	16	13	12	18	18 to 20	8 to 12	4 to 7
BEANS.....qt.			10	13		9	7 to 0	5 to 9
BREAD.....lb.	4 to 5	3	3 to 7	6	4	3½ to 4½	4 to 4½	4 to 4½
BUTTER.....lb.	20 to 50	25	22	28	36	29 to 38	25 to 32	16 to 40
COAL.....ton.			\$4.25	\$11.00		\$2.65 to 4.10	\$3 to 5.25	\$3 to 6.75
COFFISH.....lb.				9		6 to 8	6 to 7	5 to 9
COFFEE.....lb.	30 to 40	30	35	32	30	28 to 50	20 to 30	16 to 40
EGGS.....doz.	20 to 25	18	20	18	20	14 to 30	25 to 30	10 to 24
FLOUR.....lb.	4	4	5½	10	7	3½ to 4½	3 to 4	2½ to 4½
LARD.....lb.	20	20	21	22		12 to 18	10 to 12	6 to 10
MILK.....qt.			4	7	5	5 to 9	8 to 10	3 to 6
MUTTON, fore qr.....lb.	16	16	14½	15	18	16 to 17	9 to 10	5 to 12½
MUTMEAL.....lb.			8			3½ to 4½	4 to 5	4 to 5
PORK, fresh.....lb.	16	14	17	13	18	10 to 16	8 to 10	4 to 5
PORK, salted.....lb.	16	14	17	18	20	10 to 16	8 to 10	6 to 12
PORK, Bacon.....lb.	18	20	20	22		12 to 16	8 to 10	7 to 12
PORK, Sausage.....lb.	16	16	19	20		18	8 to 10	6 to 10
POTATOES.....bushel.	56	50	50	\$1.15	60	68 to \$2.00	\$1.40 to 1.60	60 to 80
RICE.....lb.			9	6		3½ to 8	8 to 10	5 to 10
SOAP.....lb.			10	4		5½ to 9	6 to 7	3 to 8
SUGAR.....lb.	15 to 20		11	8½	8	5½ to 10	8 to 10	7 to 10
TEA.....lb.			75		50	40 to 88	50 to 60	25 to \$1.00

COMPARATIVE RATES OF WEEKLY WAGES

Paid in Europe and in the United States in 1878.

[Condensed from the report of the Secretary of State on the State of Labor in Europe, derived from facts reported by the United States Consuls, Washington, 1879.]

	Belgium.	Denmark.	France.	Germany.	Italy.	Great Britain.	UNITED STATES.	
							New York.	Chicago.
BAKERS	\$4.40	\$4.25	\$5.55	\$3.50	\$3.90	\$6.50 to 6.60	\$ 5 to 8	\$ 8 to 12
BLACKSMITHS	4.40	3.90	5.45	3.55	3.94	7.04 to 8.12	10 to 14	9 to 12
BOOKBINDERS		3.72	4.85	3.82	3.90	6.50 to 7.83	12 to 18	9 to 20
BRICKLAYERS	6.00		4.00	3.60	3.45	7.58 to 9.03	12 to 15	6 to 10½
CARPENTERS	4.80		6.00	3.97	4.95	7.70 to 8.48	9 to 13	7 to 15
CARPENTERS AND JOINERS	5.40	4.25	5.42	4.00	4.18	7.33 to 8.25	9 to 12	7½ to 12
FARM LABORERS			3.15	2.87	3.50	3.40 to 4.25		
LABORERS, PORTERS, Etc	3.00			2.92	2.60	4.50 to 5.00	6 to 9	5½ to 9
PAINTERS	4.20	4.15	4.90	3.92	4.60	7.25 to 8.16	10 to 16	6 to 12
PLASTERERS	5.40			3.80	4.35	7.68 to 10.13	10 to 15	9 to 15
PLUMBERS	6.00		5.50	3.60	3.90	7.13 to 8.46	12 to 18	12 to 20
PRINTERS		4.62	4.70	4.80	3.90	7.52 to 7.75	8 to 18	12 to 18
SHOEMAKER		3.30	4.75	3.12	4.32	7.52 to 7.55	12 to 18	9 to 18
TAILORS		4.10	5.10	3.58	4.30	5.00 to 7.30	10 to 18	6 to 18
TINSMITHS	4.80	3.90	4.40	3.65	3.60	6.00 to 7.30	10 to 14	9 to 12

CENSUSES OF THE UNITED STATES.

The census is taken in the United States in obedience to the Constitution, which commands that an actual enumeration or census shall be made within three years after the first meeting of the Congress, and within every subsequent term of ten years, in such manner as Congress shall by law direct. Under our system of government, the census is of more importance in the United States than in most other countries, because representation in Congress and direct taxes are apportioned according to numbers in the States.

Date of Admission or Organization. Area, and Population of the States and Territories from 1790 to 1880.

STATES AND TERRITORIES.	Date	Area in Square Miles.	TOTAL POPULATION.										
			1790.	1800.	1810.	1820.	1830.	1840.	1850.	1860.	1870.	1880.	
Alabama.....	1819	50,722	.....	.....	.....	127,801	309,527	500,756	771,623	964,201	996,992	1,292,505
Arkansas.....	1836	52,198	.....	.....	.....	14,255	30,388	97,574	209,897	435,450	484,471	802,525
California.....	1850	157,801	.....	.....	.....	.....	.....	.....	379,804	560,247	864,659	.....
Colorado.....	1876	104,500	.....	.....	.....	.....	.....	.....	34,277	39,864	194,327	.....
Connecticut.....	1788	4,750	237,946	251,002	261,942	275,148	297,675	309,978	370,792	460,147	537,454	622,700	
Delaware.....	1787	2,120	59,096	64,273	72,674	79,749	76,748	78,085	91,532	112,216	125,015	146,608	
Florida.....	1845	59,268	.....	.....	.....	.....	34,730	54,477	87,445	140,424	187,748	260,493
Georgia.....	1788	58,000	82,548	162,686	252,433	310,985	516,823	691,892	906,185	1,057,286	1,184,109	1,542,180	
Illinois.....	1818	55,410	.....	.....	.....	12,282	55,162	476,183	851,470	1,711,951	2,539,891	3,077,871
Indiana.....	1816	33,809	.....	.....	.....	141,178	343,031	635,866	988,416	1,300,428	1,680,637	1,978,301
Iowa.....	1846	55,045	.....	.....	.....	.....	.....	43,112	192,214	674,913	1,194,020	1,624,315
Kansas.....	1861	8,891	.....	.....	.....	.....	.....	.....	.....	107,206	364,899	996,096
Kentucky.....	1792	37,680	73,677	220,955	406,511	564,135	687,917	779,828	982,405	1,155,684	1,321,011	1,648,690	
Louisiana.....	1812	41,346	.....	.....	.....	75,556	152,923	215,739	352,411	517,762	708,002	736,915
Maine.....	1820	35,000	96,540	151,719	228,705	298,269	309,455	501,793	683,169	628,279	626,915	648,396	
Maryland.....	1788	11,124	319,728	341,548	380,546	407,350	447,040	470,019	583,084	687,049	780,894	934,913	
Massachusetts.....	1788	7,800	375,787	422,845	472,040	523,159	610,408	737,099	994,514	1,231,066	1,457,351	1,781,085	
Michigan.....	1837	56,451	.....	.....	.....	8,765	31,639	217,267	397,054	749,113	1,184,059	1,596,937
Minnesota.....	1858	83,531	.....	.....	.....	.....	.....	.....	6,077	172,023	430,706	780,773
Mississippi.....	1817	47,156	.....	.....	.....	.....	136,021	375,651	606,526	791,305	827,922	1,131,597
Missouri.....	1821	65,350	.....	.....	.....	75,448	140,455	383,702	682,044	1,182,012	1,721,205	2,168,380
Nebraska.....	1867	75,995	.....	.....	.....	66,557	.....	.....	.....	28,841	122,993	452,402
Nevada.....	1864	112,090	.....	.....	.....	.....	.....	.....	.....	6,857	42,491	62,266

New Hampshire*	1788	9,280	141,885	183,858	214,400	244,022	260,328	284,574	317,976	326,073	318,300	316,991
New Jersey*	1787	8,320	184,139	211,149	245,562	277,426	320,823	373,306	480,555	672,035	906,096	1,131,116
New York*	1788	47,000	340,120	589,051	959,049	1,372,111	1,915,608	2,428,921	3,097,394	3,880,735	4,382,759	5,082,871
North Carolina*	1789	50,704	393,751	478,103	555,500	638,829	737,987	753,419	869,039	992,622	1,071,361	1,399,750
Ohio.....	1802	39,964	.....	45,365	230,760	581,295	937,903	1,519,467	1,980,359	2,330,511	2,665,260	3,198,962
Oregon.....	1859	95,274	.....	.....	.....	.....	.....	.....	13,294	52,465	90,923	174,768
Pennsylvania*	1787	46,000	431,373	602,365	810,091	1,047,597	1,318,333	1,724,033	2,311,786	2,906,215	3,521,951	4,283,891
Rhode Island*	1790	1,506	68,825	69,122	76,931	83,015	97,199	108,830	147,545	174,629	217,353	276,531
South Carolina.....	1788	34,000	249,073	345,591	415,115	502,741	581,185	688,507	703,708	705,606	705,606	995,677
Tennessee.....	1796	45,600	35,691	105,602	261,727	422,771	681,904	829,210	1,002,717	1,109,891	1,238,520	1,542,359
Texas.....	1845	274,336	.....	.....	.....	.....	.....	.....	212,592	604,215	818,579	1,591,749
Vermont.....	1791	9,612	85,425	154,465	217,895	235,966	280,672	291,948	314,120	315,098	330,551	332,286
Virginia (E & W)*.....	1788	61,352	747,610	880,200	974,600	1,065,116	1,211,405	1,239,797	1,421,661	1,596,318	1,225,163	1,512,565
West Virginia.....	1863	23,000	.....	.....	.....	.....	.....	.....	.....	.....	442,014	618,457
Wisconsin.....	1848	53,924	.....	.....	.....	.....	.....	30,945	305,391	775,881	1,004,670	1,315,497
The States.....		3,929,214	5,924,300	7,215,858	9,000,783	12,820,868	17,019,641	23,067,262	31,183,714	38,115,641	49,371,340	
Alaska.....	1868	577,390	.....	.....	.....	.....	.....	.....	.....	.....	.....	40,440
Arizona.....	1863	113,916	.....	.....	.....	.....	.....	.....	.....	.....	9,658	177,624
Dist. of Columbia.....	1790	64	.....	14,093	24,023	33,039	39,834	43,712	51,687	75,080	131,700	135,177
Dakota.....	1861	150,932	.....	.....	.....	.....	.....	.....	.....	4,857	14,181	32,610
Idaho.....	1863	86,294	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Indian.....	1834	68,991	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Montana.....	1894	143,776	.....	.....	.....	.....	.....	.....	.....	.....	20,595	39,159
New Mexico.....	1850	121,201	.....	.....	.....	.....	.....	.....	61,547	93,516	91,874	119,565
Utah.....	1850	84,476	.....	.....	.....	.....	.....	.....	11,330	40,273	86,786	143,963
Washington.....	1853	69,944	.....	.....	.....	.....	.....	.....	.....	11,594	23,975	75,116
Wyoming.....	1868	97,853	.....	.....	.....	.....	.....	.....	.....	.....	9,118	20,789
The Territories..	2	819,811	.....	14,093	24,023	33,039	39,834	43,712	124,614	250,577	442,730	784,443
Total Population....		3,929,214	5,308,483	7,239,881	9,033,822	12,846,020	17,060,463	23,191,876	31,443,321	38,558,371	50,155,783	

*The thirteen original States. The dates given are those of their ratification of the Federal Constitution.
†No territorial government.

Inland Seas of the World.

Name.	Size.	Depth.
Caspian Sea,	176,000 sq miles.	250 feet.
Aral Sea,	30 0 0 "	100 "
Dead Sea,	803 "	200 "
Lake Baikal,	12,000 "	750 "
Lake Superior,	32,000 "	1 000 "
Lake Michigan,	22,400 "	1 000 "
Lake Huron,	21,000 "	1,000 "
Lake Erie,	10,815 "	204 "
Lake Ontario,	6 300 "	336 "
Lake Nicaragua,	6,000 "	300 "
Lake Titicaca,	3 012 "	700 "
Salt Lake,	1,875 "	1,400 "
Lake Tchad,	14,900 "	350 "
Lake Ladoga,	12,000 "	1,200 "

Average Velocity of Bodies.

Bodies.	Per Hour.	Per Sec.
A man walks	3 miles. or	4 feet.
A horse trots	7 " or	10 "
A horse runs	20 " or	29 "
Steamboats move	18 " or	26 "
Sailing vessels move	10 " or	14 "
Slow rivers flow	3 " or	4 "
Rapid rivers flow	7 " or	10 "
Moderate wind blows	7 " or	10 "
A storm move	36 " or	52 "
A hurricane moves	80 " or	117 "
A rifle ball moves	1,000 " or	1,466 "
Sound moves	743 " or	1 142 "
Light moves	192 000 miles per second.	
Electricity moves	288,000 " " "	

Length of the Principal Rivers.

IN EUROPE — The Danube, 1,800 miles; Dnieper, 1,260; Don, 1,120; Rhine, 691; Elbe, 800; Rhone, 650; Volga, 2,800.

IN ASIA. — Ganges, 1,970; Irrawaddy, 2,600; Indes, 2,300; Euphrates, 1,750; Amoor, 2,800; Yang-tse-Kiang, 3,300; Hoang-Ho, 2,700; Zambesi, 800; Yenisei, 3,250; Obi, 2,700.

IN AFRICA. — Nile, 2,500; Niger, 2,600; Senegal, 1,900; Gambia, 1,700.

IN AMERICA. — Missouri to the Mississippi, 3,100; Missouri to the Gulf, 4,350; Mississippi, 3,160; Amazon, 3,600; River De La Plata, 2,240; St. Lawrence, 2,100; Orinoco, 1,600; Rio Grande, 1,800.

Frequent Faults in Speaking and Writing Explained and Corrected.

These few pages are intended to explain and correct the common errors in speaking and writing, not only of the uneducated, but of those who have not looked into a grammar since they left school.

The language is common property, and one of the most laudable objects an educated man can pursue is to defend it from contamination. "He who hunts down and pillories a slang phrase, a vulgarism, a corruption of any kind, is a public benefactor."

"I *thought to have written* last week" is a very common phrase; but it is certainly vicious. It should be "I *thought to write* last week," We should say "I intended to see you," not "to have seen you."

"I think it proper to write to you," not "thought."

"I *had rather*" should be "I *would rather*," which latter is the regular, analogous and proper expression.

"If I am *not mistaken*" should be "If I *mistake not*."

"He *lays on the couch*" should be "He *lies on the couch*."

"If I *was him*" should be "If I *were he*."

"*There's twenty*" should be "*there are twenty*." "He was no sooner gone than I called him" and "they were no sooner left than I called," should be "had no sooner."

"It *grieves me to do it*" should be "I *am grieved to do it*." "*It distresses me to think of it*" should be "I *am distressed to think of it*." "*This house to let*" should be "*This house to be let*." "Be that as it will" should be "Be that as it *may*."

"Accounts are requested to be settled quarterly" should be "It is requested that accounts be settled quarterly."

"Are you going to *come*?" should be "Are you *coming*?"

"He *begun*" should be "He *began*." "I have *began*" should be "I have *begun*."

"You have *broke* your word" should be "You have *broken* your word."

"To be *drank*" should be "To be *drunk*."

"I *eat heartily*" should be "I *ate heartily*;" they are pronounced alike.

"I have *rang* the bell" should be "I have *rung* the bell."

"You have *trod* on my corn" should be "You have *trodden* on my corn."

"He has *wore* that suit a long time" should be "He has *worn* that suit a long time."

"From *here* to there" should be "From *this* place to *that*."

"An unpleasant *effluvia*" should be "An unpleasant *effluvium*."

Effluvium is a Latin word having *Effluvia* for the plural.

Memorandums and *encomiums* are now as often used as the classical plurals *memoranda* and *encomia*. These words may be considered Anglicized.

None (as a pronoun) is used in both numbers, as "*None are* so deaf as *they* who will not hear," or "*None is* so deaf as *he* who will not hear."

"He wrote to me *previous* to his coming to Baltimore" should be "He wrote to me *previously*."

"He acted *bolder* than was expected" should be "He acted *more boldly* than was expected."

"Conformable to your directions" should be "*conformably*."

"Agreeable to my promise" should be "*agreeably*."

"He is *like* to be" should be "He is *likely* to be."

"The plan was approved *of* by all present." Omit "*of*."

"He is known *through* Maryland" should be "*throughout*."

"He lives opposite the park" should be "Opposite *to* the park."

"He writes me frequently" should be "writes *to me*."

"Derogatory *to*" should be "derogatory *from*."

"It looks well *at night*" should be "*by night*."

"Accompanied *with* a proper tone of voice" should be "accompanied *by*."

Population and Debt of Cities of United States.

Name of Place.	Population. Census 1880.	Debt 1880.	Debt for each person.
Albany, N. Y.	90,758	\$ 3,683,765	\$ 40.59
Amsterdam, N. Y.	9,466	9,000	95
Anbarn, N. Y.	21,924	530,000	24.17
Attleborough, Mass.	11,111	16,600	1.49
Atchison, Kan.	15,105	449,687	29.77
Aurora, Ill.	11,873	25,506	2.15
Atlanta, Ga.	37,409	2,180,000	58.27
Augusta, Ga.	21,891	1,959,519	89.51
Akron, Ohio.	16,512	17,619	1.07
Alleghany, Penn.	78,682	1,596,429	20.29
Allentown, Penn.	18,063	430,443	23.83
Altoona, Penn.	19,710	389,700	19.77
Austin, Texas.	11,013	106,744	9.69
Alexandria, Va.	13,659	1,037,088	75.98
Appleton, Wis.	8,005	100,545	12.56
Buffalo, N. Y.	155,124	8,211,934	52.93
Bridgeport, Conn.	29,148	740,268	25.40
Bloomington, Ill.	17,180	221,463	12.89
Belleville, Ill.	10,683	217,712	20.38
Burlington, Iowa.	19,450	128,061	6.58
Bangor, Me.	16,856	2,661,000	157.87
Biddeford, Me.	12,651	183,874	14.53
Baltimore, Md.	332,313	854,466	2.57
Boston, Mass.	362,839	28,244,018	77.84
Bay City, Mich.	20,693	438,470	21.19
Binghamton, N. Y.	17,317	299,500	17.30
Brookton, Mass.	13,608	71,200	5.23
Brooklyn, N. Y.	566,663	38,040,000	67.13
Bellaire, Ohio.	8,025	106,000	13.21
Bradford, Penn.	9,197	.....	.....
Burlington, Vt.	11,365	383,427	33.74
Chicago, Ill.	503,185	12,794,271	25.43
Columbus, Ga.	10,123	540,800	53.42
Cedar Rapids, Iowa.	10,104	40,867	4.04
Council Bluffs, Iowa.	18,063	138,400	7.66
Covington, Ky.	29,720	1,030,000	34.66
Cambridge, Mass.	52,669	3,403,723	64.62
Chelsea, Mass.	21,782	1,554,496	71.37
Chicopee, Mass.	11,286	100,050	8.86
Cumberland, Md.	10,693	394,064	36.85
Concord, N. H.	13,843	615,500	44.46
Camden, N. J.	41,659	1,164,900	27.96
Cohoes, N. Y.	19,416	141,214	7.27
Canton, Ohio.	12,258	180,557	14.74
Chillicothe, Ohio.	10,938	.....	.....
Cincinnati, Ohio.	255,139	21,992,500	86.20
Cleveland, Ohio.	160,146	6,467,046	40.38
Columbus, Ohio.	51,647	1,259,162	24.38
Carbondale, Penn.	7,714	9,369	1.21
Chester, Penn.	14,997	357,084	23.81
Columbia, Penn.	8,312	151,500	18.23
Charleston, S. C.	49,984	4,129,102	82.61
Columbia, S. C.	10,036	954,850	85.18
Chattanooga, Tenn.	12,892	116,264	9.02
Danbury, Conn.	11,666	255,415	21.89
Derby (town), Conn.	11,650	80,243	6.89
Denver, Col.	35,629	20,000	.56
Davenport, Iowa.	21,831	290,675	13.31
Des Moines, Iowa.	22,408	578,000	25.79
Dubuque, Iowa.	22,254	804,611	36.16
Detroit, Mich.	116,340	2,282,772	19.62
Dover, N. H.	11,687	458,830	39.26

Population and Debt of Cities of U. S.—Continued.

Name of Place.	Population. Census 1880.	Debt 1880.	Debt for each person.
Danville, Penn.....	8,346	\$ 178,767	\$ 21.42
Davton, Ohio.....	38,678	1,101,521	28.48
Dallas, Texas.....	10,368	304,334	29.38
Danville, Va.....	7,526	543,000	72.15
Evansville, Ind.....	29,280	1,984,000	67.76
Elizabeth, N. J.....	28,229	5,512,638	195.28
Elmira, N. Y.....	20,541	270,400	13.16
East Saginaw, Mich.....	19,016	610,475	32.10
Edgewater, N. Y.....	8,044	31,900	3.97
Easton, Penn.....	11,924	219,949	18.45
Erie, Penn.....	27,737	1,148,729	41.42
Eau Claire, Wis.....	10,119	101,000	9.98
Fort Wayne, Ind.....	26,880	836,900	31.88
Fall River, Mass.....	48,961	3,160,765	64.56
Fitchburg, Mass.....	12,429	770,778	62.01
Freemont, Ohio.....	8,446	44,000	5.21
Fond du Lac, Wis.....	13,094	165,000	12.69
Galesburg, Ill.....	11,437	53,250	4.66
Gloucester, Mass.....	19,329	193,370	10.00
Grand Rapids, Mich.....	32,016	471,000	14.71
Greenwich, Conn.....	7,892	183,307	23.23
Galveston, Texas.....	22,248	1,023,249	45.90
Green Bay, Wis.....	7,464	147,140	19.71
Hartford, Conn.....	42,551	3,689,855	86.72
Haverhill, Mass.....	18,472	393,428	21.30
Holyoke, Mass.....	21,915	878,454	40.08
Hannibal, Mo.....	11,074	190,173	17.17
Hoboken, N. J.....	30,999	1,100,250	35.49
Hornellsville, N. Y.....	8,195	2,000	.24
Hudson, N. Y.....	8,670	321,250	37.05
Hamilton, Ohio.....	12,122	53,067	4.38
Harrisburg, Penn.....	30,762	1,065,300	34.63
Houston, Texas.....	16,513	1,501,592	90.93
Indianapolis, Ind.....	75,056	1,914,500	25.51
Ithaca, N. Y.....	9,105	66,303	7.28
Ironton, Ohio.....	8,857	243,758	27.52
Jacksonville, Ill.....	10,927	273,336	25.01
Joliet, Ill.....	11,657	54,000	4.63
Jackson, Mich.....	16,105	184,000	11.43
Jersey City, N. J.....	120,722	15,386,435	127.45
Janesville, Wis.....	9,015	34,000	3.77
Johnstown, Penn.....	8,380	37,000	4.42
Jacksonville, Fla.....	7,650	270,916	35.44
Kalamazoo, Mich.....	13,552	25,000	1.84
Kansas City, Mo.....	55,785	1,339,224	24.00
Keokuk, Iowa.....	12,117	372,375	30.78
Kingston, N. Y.....	18,344	644,890	35.15
Knoxville, Tenn.....	9,693	212,248	21.90
Little Rock, Ark.....	3,138	335,243	52.25
Los Angeles, Cal.....	11,183	310,177	27.74
Leadville, Col.....	14,820	112,000	7.56
La Fayette, Ind.....	14,860	300,000	20.19
Logansport, Ind.....	11,198	456,276	40.74
Lexington, Ky.....	16,656	112,000	6.72
Louisville, Ky.....	123,758	4,849,935	39.19
Lawrence, Mass.....	39,161	1,717,000	43.86
Lowell, Mass.....	59,475	1,554,274	26.13
Lynn, Mass.....	38,274	2,072,815	54.16
Leavenworth, Kan.....	16,546	396,573	23.97
Lewiston, Me.....	19,083	1,038,102	54.40
Lincoln, Neb.....	13,003	199,615	15.38
La Crosse, Wis.....	14,505	135,000	9.31
Lynchburg, Va.....	15,959	794,837	49.80
Lincoln, R. I.....	13,765	50,000	3.63
Lancaster, Penn.....	25,769	464,142	18.01

Population and Debt of Cities of U. S.---Continued.

Name of Place.	Population. Census 1880.	Debt 1880.	Debt for each person.
Lebanon, Penn.....	8,778	\$ 308,700	\$ 35.15
Lima, Ohio.....	7,567	4,500	.57
Lockport, N. Y.....	13,522	108,667	8.09
Long Island City, N. Y.....	17,129	950,000	55.44
La Salle, Ill.....	7,847	36,000	4.59
Madison, Wis.....	10,324	136,769	13.26
Malden, Mass.....	12,017	483,522	40.24
Marlborough, Mass.....	10,127	151,951	15.00
Macon, Ga.....	12,749	743,000	58.28
Manchester, N. H.....	32,630	972,907	29.81
Milwaukee, Wis.....	115,587	2,160,289	18.65
Memphis, Tenn.....	33,592	4,554,355	135.59
McKeesport, Penn.....	8,212	119,100	14.50
Meadville, Penn.....	8,860	77,699	8.77
Mansfield, Ohio.....	9,859	195,737	19.85
Middletown, N. Y.....	8,494	158,820	18.70
Madison, Ind.....	8,945	232,051	25.94
Moline, Ill.....	7,800	28,071	3.60
Millville, N. J.....	7,660	37,000	4.83
Mobile, Ala.....	29,132	2,609,250	89.57
Montgomery, Ala.....	16,713	567,900	33.98
Muskegon, Mich.....	11,262	180,000	15.98
Minneapolis, Minn.....	46,887	1,137,467	24.26
Meriden, Conn.....	18,340	798,317	43.53
Middletown, Conn.....	11,732	1,407,500	119.97
Nashua, N. H.....	13,397	459,661	34.31
New Britain, Conn.....	13,979	494,843	35.40
New Haven, Conn.....	62,882	1,584,619	25.20
New London, Conn.....	10,537	496,611	47.13
Norwalk, Conn.....	13,956	522,495	37.44
Norwich, Conn.....	21,143	1,191,257	56.34
New Albany, Ind.....	16,423	358,482	21.83
Newport, Ky.....	20,433	966,618	47.31
New Orleans, La.....	216,090	17,736,509	92.98
New Bedford, Mass.....	26,845	1,086,000	40.45
Newburyport, Mass.....	13,538	428,706	31.67
Newton, Mass.....	16,995	993,591	58.46
Newburgh, N. Y.....	18,049	313,400	17.36
New York, N. Y.....	1,206,299	109,425,414	90.71
Newark, Ohio.....	9,600	55,402	5.77
New Castle, Penn.....	8,418	72,624	8.63
Norristown, Penn.....	13,063	81,200	6.22
Newport, R. I.....	15,693	116,408	7.42
Nashville, Tenn.....	43,850	1,606,200	37.05
Norfolk, Va.....	21,966	2,187,371	99.58
North Adams, Mass.....	10,191	267,895	26.29
Northampton, Mass.....	12,172	537,500	44.16
Newark, N. J.....	136,508	9,070,032	66.44
New Brunswick, N. J.....	17,166	1,618,946	94.31
Oakland, Cal.....	34,555	669,126	19.36
Omaha, Neb.....	30,518	227,578	7.46
Orange, N. J.....	13,207	253,832	19.22
Ogdensburg, N. Y.....	10,341	135,000	13.05
Oswego, N. Y.....	21,116	1,264,224	59.87
Oshkosh, Wis.....	15,748	148,500	9.43
Ottawa, Ill.....	7,934	60,000	7.66
Ottumwa, Iowa.....	9,004	17,795	1.98
Peoria, Ill.....	29,259	716,500	24.49
Portland, Me.....	33,810	4,322,154	127.64
Pittsfield, Mass.....	13,364	385,342	28.83
Paterson, N. J.....	51,031	1,359,500	26.64
Plainfield, N. J.....	8,125	21,500	2.65
Pawtucket, R. I.....	19,030	935,000	49.13
Petersburg, Va.....	21,656	1,136,100	52.46
Portsmouth, Va.....	11,390	283,014	24.85

Population and Debt of Cities of U. S.—Continued.

Name of Place.	Population. Census 1880.	Debt 1880.	Debt for each person.
Providence, R. I.....	104,857	\$ 9,373,056	\$ 89.39
Portland, Oregon.....	17,577	76,500	4.35
Philadelphia, Penn.....	847,170	54,223,844	64.01
Pittsburg, Penn.....	156,389	14,134,296	90.38
Pottsville, Penn.....	13,253	80,442	6.07
Portsmouth, Ohio.....	41,321	317,809	28.07
Port Jervis, N. Y.....	8,678	.....	.....
Poughkeepsie, N. Y.....	20,207	1,938,198	95.97
Quincy, Mass.....	10,570	65,980	6.24
Quincy, Ill.....	27,268	1,917,888	70.33
Rockford, Ill.....	13,129	178,080	13.56
Rock Island, Ill.....	11,689	289,050	24.79
Richmond, Ind.....	12,742	167,000	13.11
Rochester, N. Y.....	89,366	5,440,686	60.88
Rome, N. Y.....	12,194	160,000	13.12
Racine, Wis.....	16,031	218,512	13.63
Rutland, Vt.....	12,149	202,460	16.6
Richmond, Va.....	63,600	4,399,021	69.11
Reading, Penn.....	43,278	999,000	23.08
Raleigh, N. C.....	9,265	138,357	14.93
Sacramento, Cal.....	21,420	861,000	40.20
San Francisco, Cal.....	233,959	3,059,285	13.08
San Jose, Cal.....	12,567	.....	.....
Salem, Ala.....	7,529	323,600	42.98
Stockton, Cal.....	10,282	385,615	37.50
Stamford, Conn.....	11,297	165,000	14.61
Savannah, Ga.....	30,709	3,425,000	111.53
Springfield, Ill.....	19,743	778,780	39.45
South Bend, Ind.....	13,280	316,975	23.87
Salem, Mass.....	27,563	1,162,488	42.18
Somerville, Mass.....	24,933	1,596,974	64.05
Springfield, Mass.....	33,340	1,928,000	57.83
Saginaw City, Mich.....	10,525	202,800	19.27
St. Paul, Minn.....	41,473	1,526,715	36.81
St. Joseph, Mo.....	32,431	1,843,662	56.85
St. Louis, Mo.....	350,518	22,847,761	65.18
Saratoga Springs, N. Y.....	8,421	297,600	35.34
Schenectady, N. Y.....	13,665	118,000	8.64
Syracuse, N. Y.....	51,792	1,351,500	26.09
Sandusky, Ohio.....	15,838	381,215	24.07
Springfield, Ohio.....	20,730	58,627	2.83
Steubenville, Ohio.....	12,093	30,190	2.50
Scranton, Penn.....	45,850	325,202	7.09
Shamokin, Penn.....	8,184	37,680	4.60
Shenandoah, Penn.....	10,147	72,800	7.17
San Antonio, Texas.....	20,550	155,266	7.56
Sherman, Texas.....	6,093	129,000	21.17
Salt Lake City, Utah.....	20,768	67,000	3.23
Terre Haute, Ind.....	26,042	267,224	10.26
Topeka, Kan.....	15,452	333,249	21.57
Taunton, Mass.....	21,213	449,715	21.20
Trenton, N. J.....	29,910	664,501	22.22
Titusville, Penn.....	9,046	328,267	36.29
Tiffin, Ohio.....	7,879	55,500	7.04
Toledo, Ohio.....	50,137	3,224,660	64.32
Troy, N. Y.....	56,747	958,296	16.89
Utica, N. Y.....	33,914	566,000	16.69
Vicksburg, Miss.....	11,814	373,218	31.59
Virginia City, Nev.....	10,917	112,000	10.26
Waterbury, Conn.....	20,270	361,508	17.83
Wilmington, Del.....	42,478	1,372,450	32.31
Washington, D. C.....	177,624	22,675,459	127.66
Waltham, Mass.....	11,712	477,000	40.73
Weymouth, Mass.....	10,570	64,392	6.09
Woburn, Mass.....	10,931	626,602	57.32

Population and Debt of Cities of U. S. — Continued.

Name of Place.	Population. Census 1880.	Debt 1880.	Debt for each person.
Worcester, Mass.....	58,291	\$ 2,447,543	\$ 41.99
Winona, Minn.....	10,208	183,000	17.93
Watertown, N. Y.....	10,697	412,000	38.52
West Troy, N. Y.....	8,820	.....	.....
Watertown, Wis.....	7,883	229,400	29.10
Warwick, R. I.....	12,164	57,500	4.73
Wheeling, W. Va.....	30,737	531,882	17.30
Wilmington, N. C.....	17,350	539,845	31.11
Wilkesbarre, Penn.....	23,339	95,097	4.07
Williamsport, Penn.....	18,934	651,272	34.40
Woonsocket, R. I.....	16,060	230,000	14.33
Windham (town), Conn.....	8,264	44,133	5.35
Yonkers, N. Y.....	18,892	1,389,000	73.52
Youngstown, Ohio.....	15,435	193,407	12.53
York, Penn.....	13,940	33,000	2.37
Zanesville, Ohio.....	18,113	529,097	29.21

Burial Places of the Presidents.

Although Washington, the capital of the nation, is naturally the place one would first choose as most appropriate for the sepulchre of our Presidents, it is surprising that only Gen. Taylor was buried there. In the following list will be found the place of sepulture of all of the Presidents:

Washington,	Mt. Vernon, Va.
John Adams,	Quincy, Mass.
Jefferson,	Monticello, Va.
Madison,	Montpelier Va.
Monroe,	Richmond, Va.
J. Q. Adams,	Quincy, Mass.
Jackson,	The Hermitage, Tenn.
Van Buren,	Kinderhook, N. Y.
Harrison,	North Bend, Ind.
Tyler,	Richmond, Va.
Polk,	Nashville, Tenn.
Taylor,	Washington, D. C.
Fillmore,	Buffalo, N. Y.
Pierce,	Concord, N. H.
Buchanan,	Lancaster, Pa.
Lincoln,	Springfield, Ill.
Johnson,	Greenville, Tenn.
Garfield,	Cleveland, O.
Grant,	New York, N. Y.

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